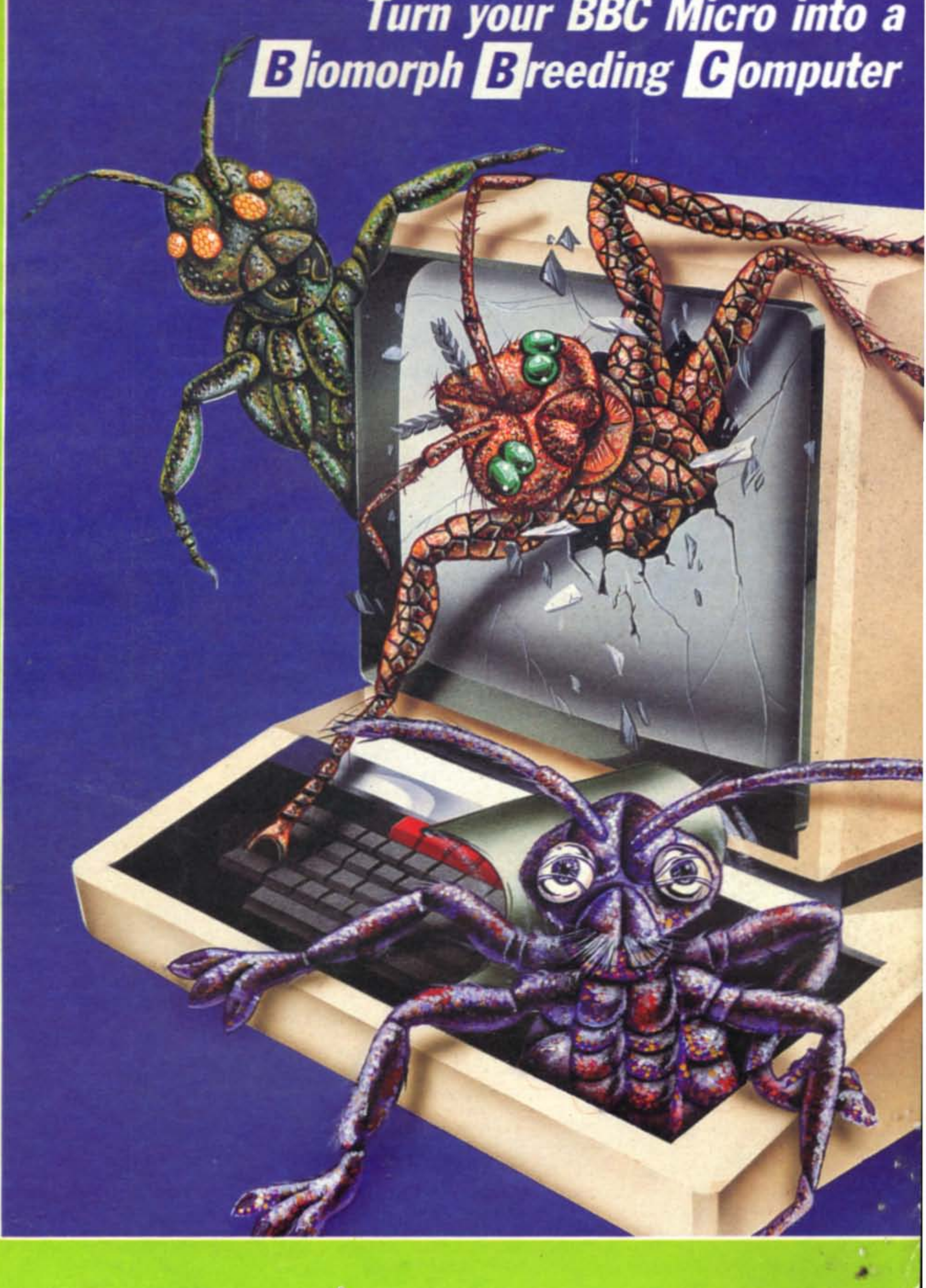
A Database Publication

THE MICRO USER

Volume 5
Number 2
April 1987
£1.25

Top-selling guide to the BBC Micro!

Turn your BBC Micro into a Biomorph Breeding Computer



ADVENTURES

Secrets of Twin Kingdom Valley

CEEFAX

Telesoftware from the BBC

EDUCATION

Programming for the disabled

FUN

Easter game – Hunkie Egg

BODY BUILD

Battery-power for your micro

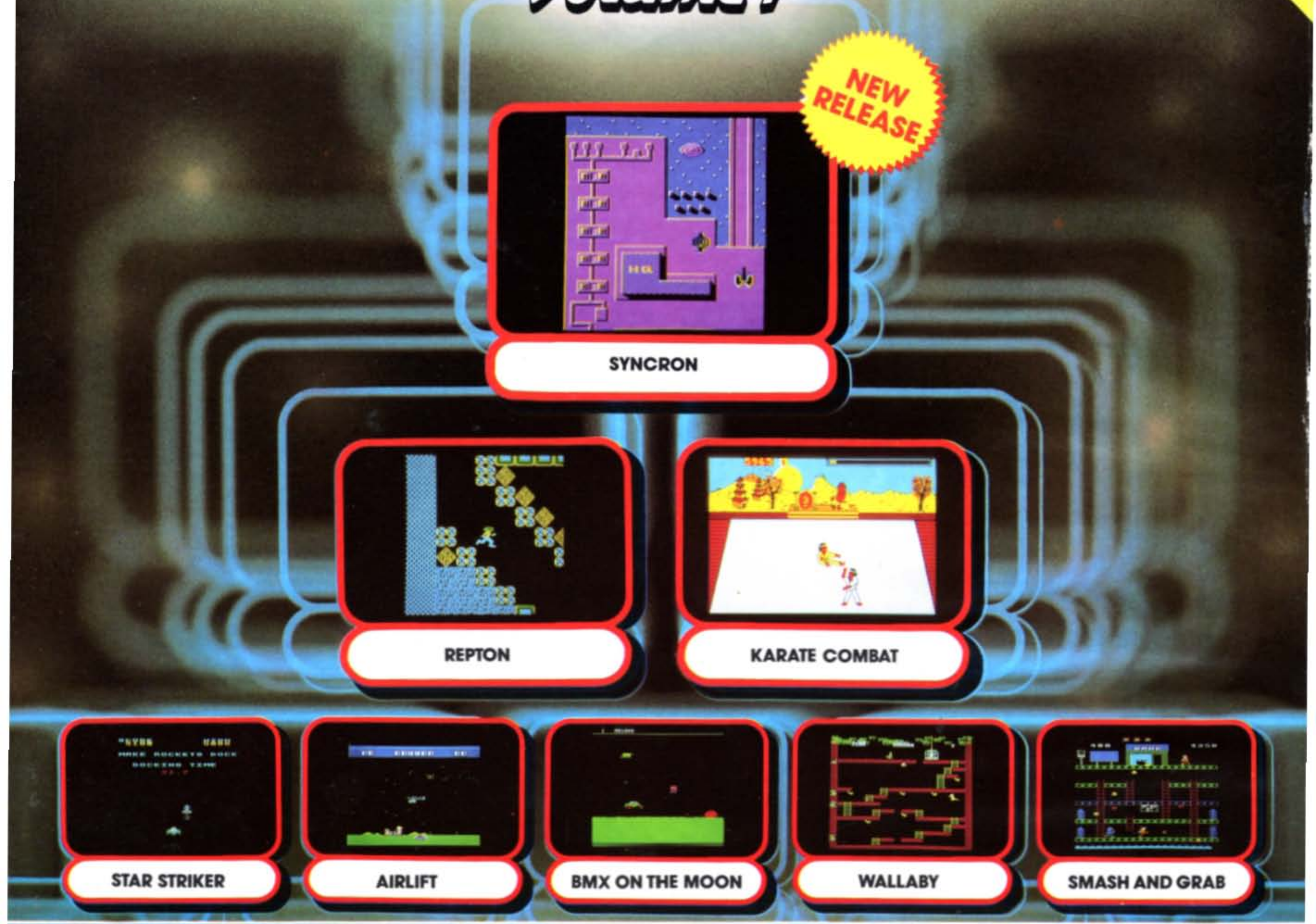
DISCS AND DRIVES

All you ever wanted to know on data storage

The Superior Collection

Volume 1

For the BBC Micro



A New Concept in Compilations

The Superior Collection Volume 1 features one brand new game, Syncron, together with 7 of Superior Software's classic hits for the BBC Micro.

Syncron is a fast-action game set against a backdrop of an enormous graphically-detailed scrolling landscape. The landscape is, in total, 1024 times the size of the screen. You must endeavour to complete 16 hair-raising missions; in each mission you have to collect a number of power cylinders, land your spacecraft on a runway with each cylinder in turn, and finally locate and bomb the HQ Building. Whilst skilfully manoeuvring your spacecraft between the defence pylons and force-fields, you are attacked by alien spacecraft and missiles launched from the land bases. A superb game, worth at least £7.95 in its own right.

BBC Micro dual cassette	£9.95
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Here's what the computer press said about some of the other titles on this compilation package:—

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Graphics 9
Sound 9
Value 8
Playability 10."
... COMPUTER & VIDEO GAMES

C+VG HIT!

AIRLIFT: "Airlift is an excellent arcade game ... It has a very polished presentation that cannot fail to impress and has the element of addictiveness which keeps you going back for one more try."
... A & B COMPUTING

SMASH AND GRAB: "As usual with Superior products the graphics are excellent, with a good use of colour and no flicker. I expect this game will have you rolling with laughter. I certainly did.

Instructions	95%
Playability	95%
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Value For Money	100%

Awarded ★★★★★ (Top Rating)"
... HOME COMPUTING WEEKLY

All games are compatible with the BBC B, B+ and Master series computers.

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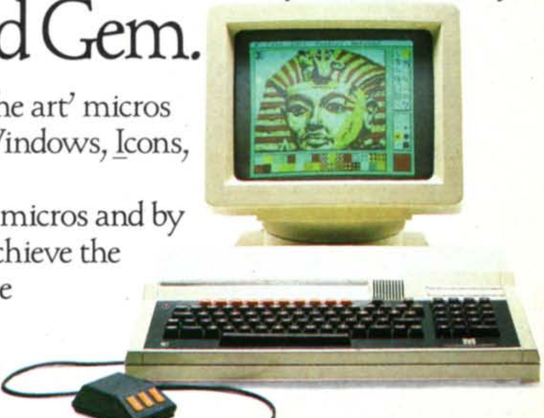

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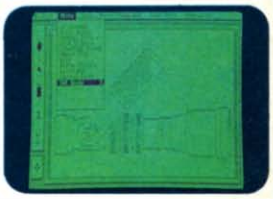

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DISCS AND DRIVES

Vol. 5 No. 2 April 1987

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Mike Cowley

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Peter Babbage
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Tel: 061-456 8835 (Editorial)
061-456 8383 (Admin.)
061-456 8500 (Advertising)
061-480 0171 (Subscriptions)
Telecom Gold: 72:MAG001
Telex: 265871 MONREF G
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The Micro User welcomes program listings and articles for publication. Material should be typed or computer-printed, and preferably double-spaced. Program listings should be accompanied by cassette tape or disc. Please enclose a stamped, self-addressed envelope, otherwise the return of material cannot be guaranteed. Contributions accepted for publication will be on an all-rights basis.

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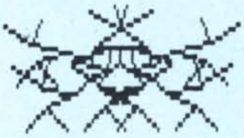
SPECIAL

The Biomorphs

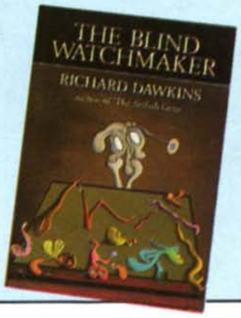


are coming!

It all began with a book, which lead to an Horizon Special on BBC TV, which was seen by Micro User technical editor Mike Cook – who was so inspired he wrote a program that turns your BBC Micro into a fertile breeding ground for infinite generations of fascinating creatures called Biomorphs.

You, too, can play with Evolution by turning to **Page 18**

Then, when you've got your breeding program under way, you can take part in our easy-to-enter contest and win a copy of the book that started it all!



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We take a detailed look

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Telesoftware:
Downloading problems explained

Game of the month:
Duck's Dinner

THE MICRO USER

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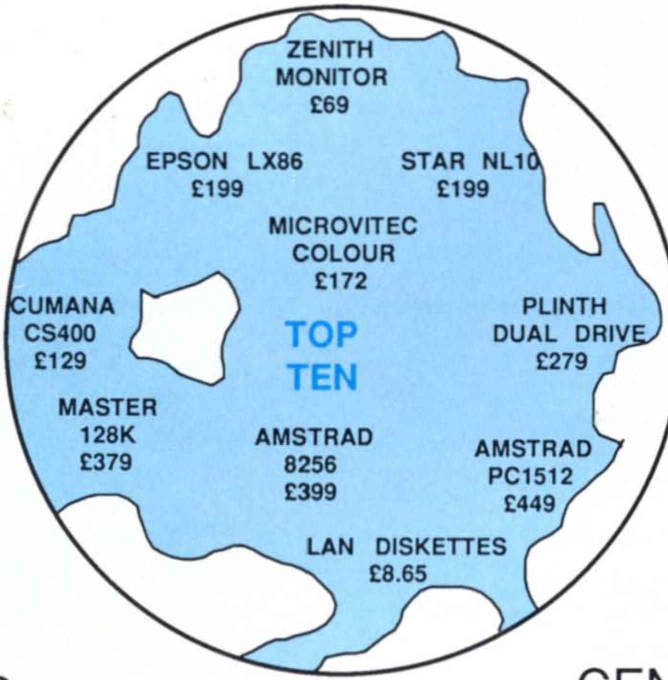
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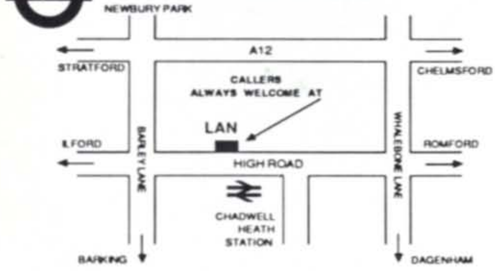
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THE MICRO USER
April
1987

NEWS

Master beats target

ACORN has hit back at critics who accused the company of fudging sales figures for the Master.

An announcement that in its first year, the machine had notched up 100,000 units was treated with scorn in some quarters. It was claimed a substantial part of the figure was made up of Olivetti-badged items sold abroad. But official Acorn spokesman Michael Page, keen to clear up the statistics, told *The Micro User:* "We have said that we have sold 100,000 machines based on Master series technology worldwide in the past year.

"This well exceeds our targets".

He said that a "small percentage" of those sales represented Olivetti-badged machines sold in Italy.

This, he said, was the same technology.

"In all 75,000 Masters with Acorn badges have been sold in this country over the past year", he maintained.

"This is the figure we are currenty using in our advertising".

New Acorn director
Paolo Tosi

Changes at top

FOLLOWING the resignations of Alex Uboldi and Jim Edwards from the board at Acorn, the company has announced three new appointments and all are existing employees of parent company Olivetti.

Paolo Tosi, managing director of Olivetti UK, and Franco Agostinucci, vice president for product strategy, have been appointed directors.

The firm's new chairman is Bruno Soggiu, Olivetti's vice president for investment coordination.

According to Acorn managing director Brian Long this reflects an increasing desire on Olivetti's part to cooperate on product and marketing developments.

"It will also provide both continuity and strength for the Acorn board, enabling the company to capitalise on the opportunities now arising", Long said.

Reuters buy 2,000 Acorn OEM boards

INTERNATIONAL news agency Reuters liked Acorn OEM boards so much . . . it bought 2,000 of them.

Acorn has been working in the original equipment manufacturer field for some time.

This order marked a significant change, and not only because of the size. It involved Acorn redesigning the BBC Micro as a Series 3 board.

The original order was for 500 a year. But because the boards worked so well as part of Econet local area networks more were ordered.

Desk space is at a premium at many Reuters' client's offices. So the agency developed a special Series 3 rack to handle standard Eurocard mountings. This arrangement allows devices to be mounted close together. And it gives access to many users while cutting desk space to a minimum.

A Reuters spokesman said: "The combination of well-proven Acorn hardware, the Econet local area network and our professional software environment allowed us to introduce a distributed network architecture well ahead of the main PC marketplace".

An Acorn spokesman said that Master boards were now available singly in electronic components catalogues.

This meant more people could customise the boards specifically to their own requirements.

Joyful mouse

REALLY serious BBC Micro users who have a battery of peripherals plugged into their machines and then find a desperate need to use a mouse have help in sight. It comes from Nidd Valley Micro Products of Wetherby in the shape of the Ana mouse, which has all the features of the company's Digimouse.

But because it is an analogue device it can be plugged into the joystick port.

The Ana is compatible with some AMX software, but can be supplied with its own CAD program.

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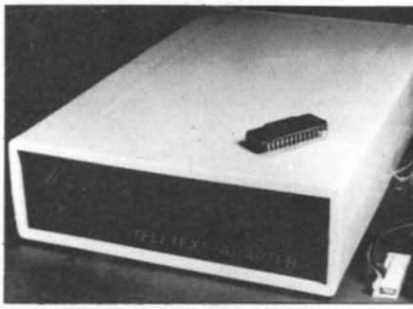

- Utils disc available including printer drivers allows pages to be selected and dumped direct to a printer (no more TV or Radio Times to buy).

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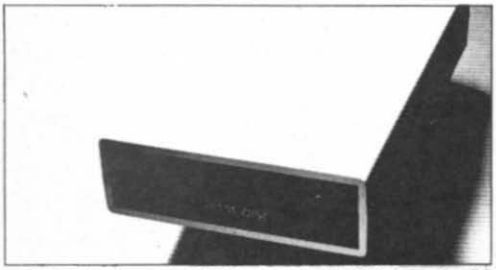

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The RAMdisc ROM operates as a utility ROM working with the current filing system rather than as a separate filing system. Therefore ensures compatibility with any Acorn compatible DFS (not ADFS).

The RAMdisc can be selected by a * command to take the place of any drive number from 0 to 9. If the RAMdisc replaces a floppy drive as 0 for example, all commands addressed to drive 0 will be intercepted by the RAMdisc. The default drive no. is 4.

'Dangerous' * commands such as *COMPACT, *COPY, *BACKUP etc are intercepted and the BBC's RAM from page 2 to &7FFF is saved to RAMdisc workspace, and may be recovered using a * command. This prevents accidental corruption of any programs/data in RAM you may have been using at the time. The save operation delays the * command by just under 0.4 seconds. The BBC's RAM can also be saved by an interrupt-driven routine which can be enabled by a * command.

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Puzzle for Charlie Chan

A MYSTERY now surrounds the question of just who was the first person to develop an effective Chinese word processor on a BBC Micro.

The April edition of *The Micro User* described a British father and son team as currently leading the world in this field.

It reported that Robert Sloss, a Cambridge University lecturer, and his 20-year-old student son Andrew, have managed to get 14,000 Chinese characters on to two floppy discs.

And more importantly they have developed a rotating drum type keyboard which will satisfy both the cultural and commercial demands of that country.

But when a copy of the magazine arrived at the home of Dr. David Fung in Wellington, New Zealand, he wasn't at all pleased.

For the Chinese doctor insists that he demonstrated a prototype of a similar word processor in his native tongue back in 1984.

"While the BBC Micro is playing a key role in this area, I have to inform you that the Sloss system is not the first with a Beeb", he said.

"My apologies to Robert and Andrew, but I cannot let non-Chinese claim that honour".

The original Fung word processor was based on a BBC Micro and an external 6502 second processor, but the latest version now uses the BBC Turbo, standard floppy disc drive and Hewlett Packard Thinkjet printer.

"It is entirely adequate for small scale publishing", says Dr. Fung. "For commercial applications however, the BBC Micro does not have sufficient graphic resolution.

"Unless Acorn can produce a high resolution screen of 1280 x 640 pixels or better, I am afraid the ultimate application will have to go to other machines".

Sinclair's new micro uses BBC Basic

THE launch of Sir Clive Sinclair's much-publicised new Z88 lapheld computer revealed a closely-kept secret – it uses BBC Basic.

In a remarkable U-turn, Sir Clive, once the most ardent critic of the language, was forced to eat his words.

He has installed BBC Basic as the resident programming language and assembler in the new machine. "BBC Basic? It was just what we needed", he declared at the Which? Computer Show launch.

The official line is that the language is established and totally debugged; that it is fast and familiar to many.

It is believed that the choice of BBC Basic is not unconnected with hopes that the Z88 could find a market in the educational field when it is pushed in that direction next year.

Industry observers have been amazed by this apparent turnaround by the computer industry's knight.

The fact that he had gone for BBC Basic certainly proved a source of amusement at the launch.

"This is akin to Winston Churchill singing the praises of Adolf Hitler", commented a source close to Acorn.

"We are only surprised at how long it has taken a man of Sir Clive's obvious intelligence to come round to appreciating how good a machine the BBC Micro is".

Sue Townsend
THE
GROWING PAINS
OF
ADRIAN MOLE
THE COMPUTER GAME

A SEQUEL to its very popular Secret Diary of Adrian Mole is now available from Virgin Games.

The Growing Pains of Adrian Mole is based on another bestselling book by Sue Townsend and players must try to make Adrian as popular as possible with everyone. Price £9.95.

Manchester show boost for education

EDUCATION matters feature highly in the coming Electron and BBC Micro User Show – including nearly 100 new programs from one company.

LCL has produced the batch for the BBC Master Compact for the show, which will feature 70 other exhibitors.

Micro English and Micro French are complete courses of 24 programs taking beginners up to O level standard. Mega Maths is a 24 program step-by-step A level course.

Also available will be Animated Arithmetic, a two program course consisting of 105 topics which aims to teach infants using moving pictures not words.

The show has been chosen to take the wraps off music software which has been four years in the making.

The International School of London with Electro Music Research has produced Score Writer, which should be of interest to music students and composers both professional and amateur.

It has already brought interest from pop star Keith Winter of Shakatak.

The package allows a composition to be created and then written on a dot matrix printer. Other users will be well catered for, too, as companies show off the latest in games, hardware and accessories.

Watford's new range of peripherals will be on show for the first time. Incorporating adjustable TV/monitor stands, 5.25in floppy discs, a disc file, an anglepoise copy holder, an anti-glare filter, an easy holder, a 5.25in disc drive head cleaner and a printer stand. All will cost £25 or under.

Watford will also have its new Co-Pro adapter on show. This £50 interface opens up the BBC Micro to advanced systems through a Master 512k board.

Flora Electronics will be unveiling their new non-volatile ram module for the BBC Micro. Available in either 16k or 32k formats it will cost £22.50 and £32.50 respectively.

Minerva will be offering to bridge the gap between its own database System Delta and both the Acornsoft View range, and all Computer Concepts' Inter products. Their new Inter/View Link costs £19.95.

They will also present Reporter which they claim is more powerful than dBase III Plus Report Writer.

It comes in two parts. One allows simple lists to be generated by two commands. The other sets up a vast range

Turn to Page 11 ▶

3½"
'COMPACT'
versions of
CJE software
available
£2 extra.

CJE micro's

ALL CJE MICRO'S SOFTWARE IS B, B PLUS, MASTER & MASTER COMPACT COMPATIBLE.

Multi-Font NLQ

NEW

Converts most printers to NEAR LETTER QUALITY in user definable Fonts.

For EPSON & EPSON Compatibles, including MX/RX/FX/LX 80/100, STAR DP510/Gemini 10X/SG10/NL10 & Citizen 120D.

Simple to use, standard EPSON codes for Underline and Doublewidth used.

After initialising Multi-Font NLQ with a '*MFNLQ', Multi-Font NLQ is normally transparent to the user. Multi-Font does claim some memory for workspace and storing font data.
Multi-Font NLQ comprises of MFNLQ ROM for the BBC, and utility disc containing the FONT definer, ten fonts, BASIC demonstration program, VIEW demo text file and Driver.
Multi-Font NLQ is compatible with nearly all software, including most BASIC programs, VIEW, WORDWISE & InterWORD (SCRIBE & Printer Buffer software currently not supported).

Ten fonts are supplied or create your own using the font definer supplied.

Fonts included are:-
Standard NLQ, Courier, Italic, Gothic, CompTS, Bold, Shadow, Outline, Broadway E, Theatre

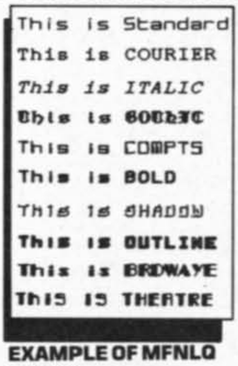
Additional Font Disc MF 'B' contains:-
Hand, Script, Stencil, Broadway, Caps, Italic-Plain, Meccano, Plain, STD large, Wire, Greek/Maths and Inverse.

For Canon & Taxan Kaga users we recommend FONTAID in preference to Multi-Font NLQ.

Multi-Font NLQ (ROM and 40/80 Disc)	**£30.00**
Additional font disc 'MF-B' (12 fonts)	**£15.00**
Additional font disc 'MF-C' (15 fonts)	**£15.00**
P & P on MFNLQ	**£ 1.00**

NEW

MASTER Write Protect and ROM select switch.
Two switches set to RAM slots to be:-
Internal ROM or RAM Read and Write or RAM Read only.
£15.00 inc VAT P&P £1.00


This is Standard
This is COURIER
This is ITALIC
This is GOTHIC
This is COMPTS
This is BOLD
This is SHADOW
This is OUTLINE
This is BRDWAYE
This is THEATRE

EXAMPLE OF MFNLQ FONTS

ENHANCED!

FONTAID

NLQ Definer for Canon & Taxan Kaga NLQ Printers.

Design your own NLQ Fonts or 'download' one of our 40+ predefined fonts.

Fonts can be downloaded within Wordwise, Inter Word or VIEW Documents allowing different fonts to be used for different paragraphs, or even individual lines of text. During downloading your Program or Text will not be corrupted.

On the FONTAID standard font Disk are the following eight fonts:- Square, Outline, Italic, Gothic, Computer Type Style, Bold, Shadow, and Broadway Engraved.

Additional disc 'A' gives an extra 11 fonts including:-
Greek/Maths, Plain, Hand & (Elite, Condensed, & Super Condensed).

Now included is a facility to issue '*' commands within a VIEW document.
To download new fonts within VIEW documents, the FONTAID ROM needs to be fitted in the BBC. (All other FONTAID facilities are available on both the FONTAID ROM & DISC). Fonts are always downloaded from Disc.

Fontaid is recommended to Canon & Taxan Kaga owners in preference to Multi-Font NLQ. As downloadable NLQ is a built-in facility of the Printer, full access to all the printers control codes is still allowed. The resolution of the FONTAID NLQ is also slightly higher than that of Multi-Font NLQ.

FONTAID requires 6264 RAM chip in printer.

FONTAID ROM & STD Font disc	(40 or 80 track)	**£30.00**
FONTAID ROM & STD Font disc with 6264 RAM	(40 or 80 track)	**£36.00**
FONTAID Additional Font DISC 'A' (11 fonts)	(40 Or 80 track)	**£15.00**
FONTAID Additional Font DISC 'B' (13 fonts)	(40 or 80 track)	**£15.00**
FONTAID Additional Font DISC 'C' (15 fonts)	(40 or 80 track)	**£15.00**

FONT ROMS of individual fonts are available eg "Square".	**£18.00**
P & P on FONTAID	**£ 1.00**

INFORM

A UNIQUE NEW POWERFUL USE FOR SIDEWAYS RAM

NEW

INFORM has been developed specifically to take full advantage of the Sideways RAM facility that many BBC micro users now have. Inform is compatible with most SIDEWAYS RAM units including ATPL Sidewise with RAM, Solidisc SWR, BBC B PLUS 128K & BBC MASTER series (not SDL256).

INFORM is a very powerful facility, which allows the user to display text information, of any kind, from Sideways RAM. This information can be readily accessed by using '*' commands from the keyboard or from application programs. In this way, much information can be displayed on the screen without stopping the current task, such as entering text in WORDWISE or VIEW.

The information in the RAM can be changed dynamically at any time.

Some of the possible applications for INFORM are:—

An on screen help manual can be created for your application, so that a reminder about more obscure points can be displayed at the users request. Information on your program or datafile contents, can remind you of their purpose.

Address and/or telephone numbers can be held and displayed quickly even while other applications are running. Very useful if you need to quickly display information about a client while he is hanging on the end of a phone!

Current prices for your products or stock position can be recalled instantly and readily modified using a wordprocessor. Similar files may be created from most databases such as VIEWSTORE.

In fact, any information to which you frequently refer can be displayed immediately without running another program. Your use of INFORM is only limited by your imagination, as they say!
There are three Inform Data Files (I.D.F.), of often used information, supplied on the disk to give an indication of the use of INFORM.

To use INFORM you must have Sideways RAM.

INFORM on 40/80 track disc. P & P on INFORM £1.00 **£20.00**

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C.J.E. BBC Printer Packs are £15.00 cassette (£16.00 disc)
(e.g. Kaga KP810 with Printer pack £260 + £15 = £275 everything included)

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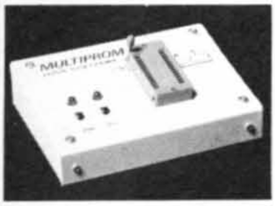
CJE micro's

NEWS



Eproms for all

FOR expert users Ground Control, the Essex manufacturers have produced an eprom programmer compatible with all BBC Micros with a user port.

Multiprom plugs into the port via 0.6 metres of ribbon cable and a socket, taking power directly from the computer.

Developed from the company's UVIPROM range, the new product requires UVP 1.1 software.

Multiprom costs £44.95 and UVP 1.1 £5.

Showcase

◄ From Page 9

of complicated formatted reports. Price £19.95.

First in a range of collections for the BBC Micro will be available from Superior Software. Each will contain seven hits plus one brand new title.

Volume One features Karate Combat, Repton, Starstriker, Airlift, Wallaby and Syncrom. Volume Two offers Kix, Repton 2, Deathstar, Space Pilot, Missile Strike, Overdrive and Crazy Painter. Both collections cost £9.95 on tape, £11.95 on disc.

Slogger will be unveiling their new 32k sideways ram for the BBC Micro. Plugging directly into a BBC rom socket it will cost approximately £25.

The Electron & BBC Micro User Show takes place at UMIST, Manchester, March 20 to 22. Doors are open from 10am to 6pm Friday and Saturday, and 10am to 4pm on Sunday.

A money-saving advance ticket order form appears on Page 15 of this issue.

BBC Micros land in jail

SIX BBC Micros are behind bars at HM Prison, Channings Wood near Newton Abbot in Devon, playing a vital role in helping the inmates learn everything from spelling to business practice.

Education Officer at the prison, Bob Howard explained that they had been used with great success for about a year.

"They are used largely as classroom accessories at present, though we do have computer literacy classes, both for the community and the inmates", said Mr Howard who is employed by the local authority.

He explained that the prisoners were able to use the BBC Micros in a variety of ways. Some simply learned to read and write with their help, others to spell and produce special letters.

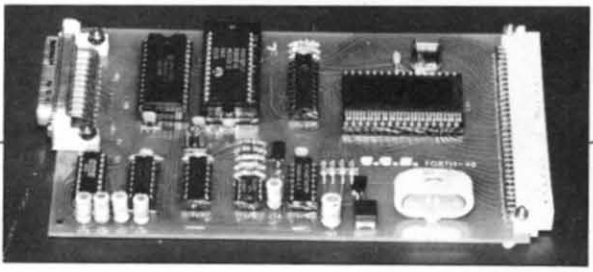
There was also a business studies course, which made use of Database Software's Mini Office II.

"All the tutors have a working knowledge of the machines but we need a full time computer tutor", he said.

"Indeed there are plans for courses on programming and word processing which will require such a person.

"We are very happy with the BBC Micros but we have to regard them as a means to an end rather than an end in themselves.

"The classes take them as they find them and are taught not to regard them as magic wands".



The computer on a card

RECENTLY formed Warwickshire company, Central Control Systems is planning to release a new "cuckoo" computer soon.

The Forth-40 is a single board computer designed to work with the BBC Micro, using rom-based software, and aimed at engineering, instrumental and laboratory work, particularly in connection with administering control and testing equipment.

It is supplied as a single height Eurocard and uses an enhanced 6502 processor running at 2Mhz.

Further features include two programmable counter timers, auto run capability at switch on, an RS232 interface and battery-backed memory.

The board will cost £130.

Merci BBC!

TWO million French people now have access to pages from Ceefax thanks to a BBC Micro.'

The BBC has just begun a six-months experiment with the French Kiosk teletext service to provide a selection of Ceefax pages.

The major problem to overcome was that the two systems operate differently. Ceefax pages are on a carousel – you wait for them to come round. The French system has a pile of pages, each section of which can be called directly.

The BBC Micro overcomes the problem by ensuring that a particular page number in Britain always takes a given place in France.

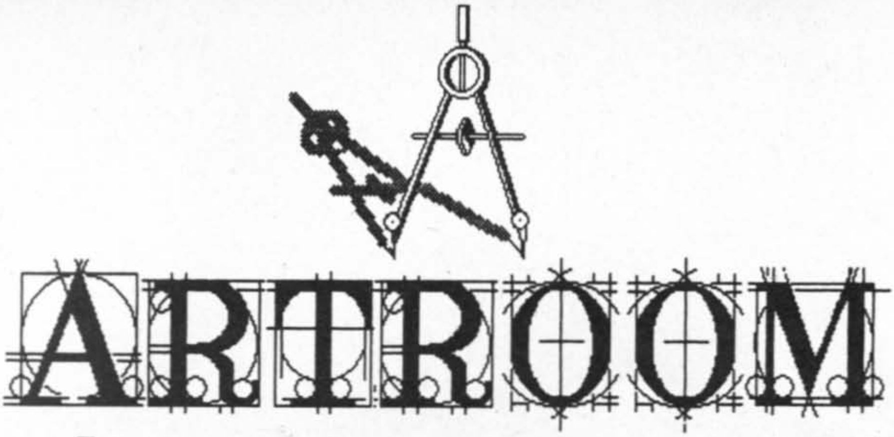
A spokesman for Ceefax explained that the Channel crossing had come about simply because the French had asked – and there was the possiblity that Ceefax could make money on it.

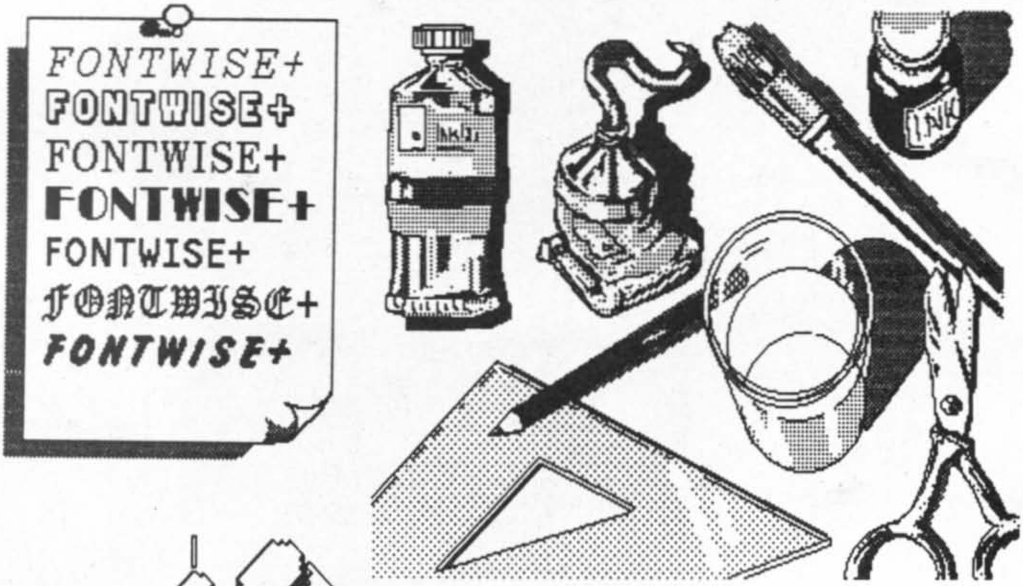
"Their system is really quite different. It is going very well; they have about two million subscribers", he said.

"They discovered about 40,000 resident English speakers in the Paris area alone and they also believe there is educational and tourist interest in the pages".

Another difference about Kiosk – just one of a number of services offered on teletext in France – is that newspapers take space on it. From now on, the BBC will provide news beside them.

Initially about 100 pages will be made available from Ceefax, updated as often as the BBC can manage.

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Red Brown Blue Green	4.95	4.65	4.25
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Fabric	3.70	3.40	3.30
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Star Gemini 10x 15x	1.50	1.20	1.10
Red Brown Blue Green	2.40	2.00	1.80
NL 10	5.50	4.80	4.50
Walters WM80 M/S	3.80	3.00	2.80
2000	3.70	3.30	2.90

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1 MTR 6.30   2 MTR 8.50

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5mm clear perspex
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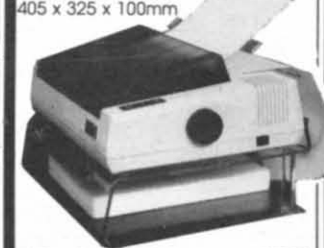

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9.40	**8.90**	**8.50**

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Certified lifetime warranty
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DS/DD 40	7.50	7.00	6.50
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Unbranded 3½" Discs

Lifetime Guarantee/label sets

SS/DD	17.00	16.00	15.00
DS/DD	19.00	18.00	17.00

3M 5¼" Lifetime Guarantee

SS/DD 40	10.30	9.90	9.60
DS/DD 40	12.50	12.20	11.90
DS/DD 80	15.20	15.20	14.90

3M 3½" Lifetime Guarantee

SS/DD	20.50	20.30	20.00
DS/DD	25.50	25.30	25.00

Verbatim Datalife 5¼"

SS/DD 40	11.70	11.40	11.10
DS/DD 40	14.70	14,40	14.10
DS/DD 80	19.70	19.40	19.10

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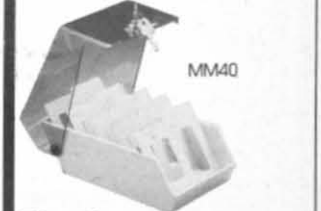
EXACT A4				
11⅔x9¼	70	2	24.00	21.30
	90	1	15.20	12.70

A4 Fixed tractor paper available



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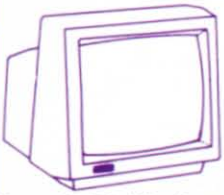

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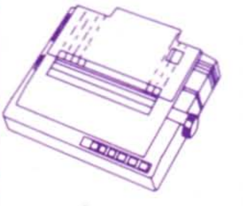

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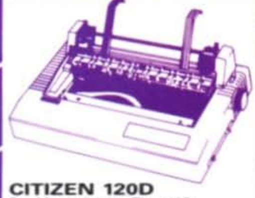

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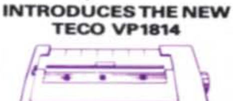

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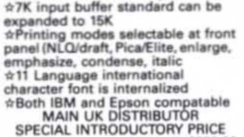

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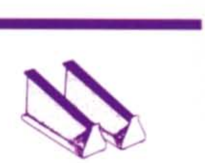

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Mike Cook plays about with evolution

Breeding (micro style) can be fun

ANYONE watching the recent edition of Horizon about Darwinian evolution could not fail to be impressed by the simulated evolution of the little figures known as Biomorphs.

I was so taken by it that I laid down my soldering iron and started to program my own version for the BBC Micro.

The principles of the simulation are explained in chapter 3 of Richard Dawkins' book The Blind Watchmaker, where he demonstrates that dramatic large scale development may be achieved by the accumulation of numerous small changes.

The appearance of any creature is determined by its genes which are passed on to its offspring to produce near identical creatures.

However, every so often one of the genes mutates or changes slightly resulting in a significantly different creature.

If this creature has a slightly increased chance of survival then it will prosper and an increasing number of the population will carry the same gene pattern. Eventually the whole of the population may contain the same gene types.

In our simulation (to save time) each offspring acquires one mutated gene from its parents. We can then choose the child to breed from for the next generation.

This is more like selective breeding than natural selection, but if you equate the ability to please the selector (you) with chances of survival then it amounts to the same thing.

The small creatures in the simulation, christened Biomorphs by Dawkins, had nine genes. But the display and memory constraints on the BBC Micro necessitate a little simplification, so our Biomorphs have only six.

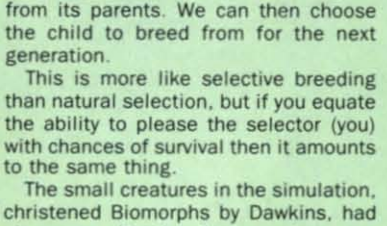

Figure I: Bifurcating trees

The basic shape is a simple bifurcating tree drawn by a recursive procedure: This is illustrated in Figure I.

Each gene controls some aspect of the drawing, as shown in Table I. It is not important, however, to understand what the genes do. In fact it could be considered to be an undue influence upon your selection.

The full listing of the Biomorph is given as Listing I. When it runs you are invited to choose the starting position for your evolution.

The choices are a microbe, where all the gene values are set close to the minimum, a random point chosen close to the minimum values, or some preset point.

Using this last option you can continue breeding from where you left off if you have made a note of the gene values.

At the centre of the screen is the parent biomorph and the mutated offspring are shown in the 12 surrounding boxes. Each mutation contains only one gene different from its parent.

There are 12 offspring because each of the six genes can change by a positive or negative increment. Note that they all look very similar – there will only be slight differences between them.

In fact, at the smaller sizes these differences might make no discernable difference. The gene values are extremely interdependent and all their effects grow with increasing complexity.

You will be invited to choose an offspring from which to breed the next generation and this can be selected by pressing any key, A to L. If any other key is pressed, the value of the parent's genes will be printed and the parent will be drawn.

There is nothing in the program to stop the Biomorphs growing out of their boxes but this can be prevented by the appropriate selection of offspring to breed from.

Many creatures or shapes can be evolved – a simple one is shown in the screen dump in Figure II. It is fun to give your creations names – I call these Bumble Drones.

Once during development I got a passable likeness of an owl being mobbed by a sparrow but it was gone before I could print out the gene values.

This is a program that can be extensively tinkered with, as the gene maximum, minimum and increments are all contained in data statements and can be easily altered.

You could also include a feature to record the progress of your creatures and the gene values of each generation parent on disc file or printer.

If you want to incorporate a screen dump add the line:

```
1085 IF A$=" " THEN CALL dump
```

Make sure your dump routine is loaded up before you run the program and when you have the screen you want press the spacebar to dump.

In a sense, as Dawkins points out, you are not creating the creatures but discovering them. However, as the number of possible creatures is so large the two processes become very similar.

The program as printed is capable of generating 152,128,595 shapes. If you could view them at the rate of one per second, it would take you just over 48 years to see them all.

- *Create a biomorph and win a prize – see Page 21.*

```
  100 REM * Biomorphs *
  110 REM  by Mike Cook
  120 REM (c) Micro User
  130 MODE1
  140 DIM morph(5,12),parent(5)
  150 DIM gi(5,2),px(12),py(12)
  160 REM READ IN INCREMENTS AND LIMITS
(MIN & MAX) OF EACH GENE
  170 RESTORE 200
  180 FOR A%=0 TO 2:FOR B%=0 TO 5
  190 READ gi(B%,A%):NEXT:NEXT
  200 DATA 1,4,0.16,0.2,0.16,2:REM Gene
increment value
  210 DATA 1,-36,-3.14,0.1,-3.14,-18:REM
 Gene minimum value
  220 DATA 9,36,3.14,10,3.14,18:REM Gene
 maximum value
  230 PROC_INTPOS:REM Initialise display
 position
  240 PROC_INTP:REM Initialise parent
  250 gen=0
  260 MODE 0
  270 REPEAT
  280 gen=gen+1
  290 PROC_MUTATE
  300 PROC_DISPLAY
  310 PROC_CHOSE
  320 UNTIL FALSE
  330 DEF PROC_INTP
  340 IF A$="C" THEN ENDPROC
  350 parent(0)=1
  360 parent(1)=4
  370 parent(2)=.785
  380 parent(3)=1
  390 parent(4)=0
  400 parent(5)=0
  410 IF A$="A" THEN ENDPROC
  420 FOR A%=0 TO 5
  430 parent(A%)=(RND(5)+1)*gi(A%,0)
  440 NEXT
```

Listing I

Gene 0	Depth of recursion used.
Gene 1	Basic size of line.
Gene 2	Branching angle.
Gene 3	Aspect ratio.
Gene 4	Branching angle incremented at each new level of recursion.
Gene 5	Line size incremented at each new level of recursion.

Table I: the Biomorph genes

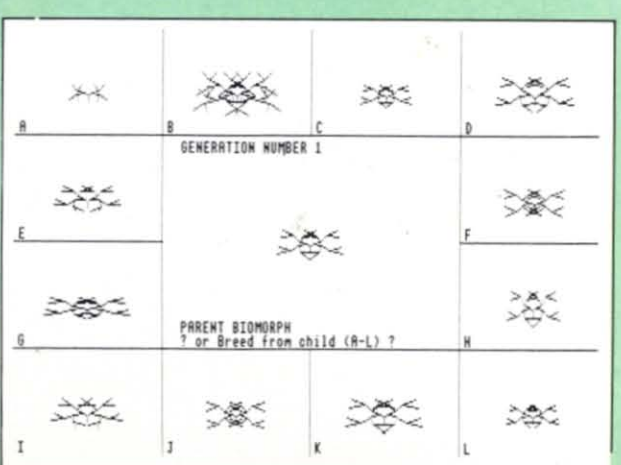

Figure II: Biomorph of the following gene structure:
Gene 0 = 4 Gene 1 = 12 Gene 2 = 0.48
Gene 3 = 0.8 Gene 4 = 0.96 Gene 5 = –4

```
  450 parent(0)=RND(3)+1
  460 ENDPROC
  470 DEF PROC_MUTATE
  480 FOR B%=1 TO 12
  490 FOR A%=0 TO 5
  500 morph(A%,B%)=parent(A%)
  510 IF (B%MOD2) D%=-1 ELSE D%=1
  520 C%=(B%-1)DIV2
  530 IF C%<>A% THEN 560
  540 IF morph(A%,B%)+D%*(gi(A%,0))<gi(A
%,1) OR morph(A%,B%)+D%*(gi(A%,0))>gi(A%
,2) THEN 560
  550 morph(A%,B%)=morph(A%,B%)+D%*(gi(A
%,0))
  560 NEXT:NEXT:ENDPROC
  570 DEF PROC_DISPLAY
  580 PROC_LINES
  590 PROC_TREE(parent(0),parent(1),pare
nt(2),parent(3),parent(4),parent(5),640,
500)
  600 FOR A%=1 TO 12
  610 PROC_TREE(morph(0,A%),morph(1,A%),
morph(2,A%),morph(3,A%),morph(4,A%),morp
h(5,A%),px(A%),py(A%))
  620 NEXT:ENDPROC
  630 DEF PROC_INTPOS
  640 RESTORE 840
  650 FOR A=1 TO 12
  660 READ px(A),py(A):NEXT
  670 PRINT''SPC(14);"Biomorph"
  680 PRINT"An exercise in Darwinian Evo
lution"
  690 PRINT'"By Mike Cook"
  700 PRINT"Based on an idea by Richard
Dawkins"
  710 PRINT"Author of THE BLIND WATCHMAK
ER"
  720 PRINT''"Options to start evolving
 from:-"
  730 PRINT"A - A microbe."
  740 PRINT"B - Some random point."
  750 PRINT"C - A defined point."
  760 PRINT'"Press the key of your choic
e.";
  770 A$=GET$:IF NOT(A$="A" OR A$="B" OR
 A$="C") THEN 770
  780 PRINT:IF A$<>"C" ENDPROC
  790 FOR A%=0 TO 5
  800 PRINT"Gene number ";A%"=";
  810 INPUT parent(A%)
  820 IF parent(A%)>gi(A%,2) OR parent(A
%)<gi(A%,1) PRINT'"Values between ";gi(A
%,1);" and ";gi(A%,2):GOTO 800
  830 NEXT:ENDPROC
  840 DATA 160,860,480,860,800,860,1120,
860,160,604,1120,604,160,348,1120,348
  850 DATA 160,92,480,92,800,92,1120,92
  860 DEF PROC_LINES
  870 VDU 12,23,1,0;0;0;0;5
  880 PRINT
  890 FOR X%=320 TO 960 STEP 320
  900 FOR Y%=256 TO 800 STEP 256
  910 MOVE X%,0:DRAW X%,1023
  920 MOVE 0,Y%:DRAW 1259,Y%
  930 NEXT:NEXT
  940 MOVE 640,260:PLOT 7,640,764
  950 MOVE 324,512:PLOT 7,958,512
  960 FOR A%=1 TO 12
  970 MOVE px(A%)-150,py(A%)-60
  980 VDU&40+A%:NEXT
  990 MOVE 360,322
 1000 PRINT"PARENT BIOMORPH"
 1010 MOVE 360,755
 1020 PRINT"GENERATION NUMBER ";gen
 1030 VDU4:ENDPROC
 1040 DEF PROC_CHOSE
 1050 VDU5:MOVE 360,290
 1060 PRINT"? or Breed from child (A-L)
?";:*FX15
 1070 A$=GET$
 1080 PRINTA$;:C%=ASCA$-&40
 1090 IF C%<0 OR C%>12 PROC_REVIEW:ENDPR
OC
 1100 FOR A%=0 TO 5
 1110 parent(A%)=morph(A%,C%)
 1120 NEXT:VDU4:ENDPROC
 1130 DEF PROC_REVIEW
 1140 VDU22,1
 1150 PRINT'"Current Biomorph has:-"
 1160 FOR A%=0 TO 5
 1170 PRINT"GENE ";A%" VALUE ";parent(A%
)
 1180 NEXT
 1190 PROC_TREE(parent(0),parent(1),pare
nt(2),parent(3),parent(4),parent(5),640,
300)
 1200 PRINTTAB(0,30);"Press any key to c
ontinue";
 1210 A$=GET$:gen=gen-1:VDU22,0
 1220 ENDPROC
 1230 DEF PROC_TREE(D,L,dA,AR,DT,DS,X,Y)
 1240 MOVE X,Y:DRAW X,Y-L
 1250 PROC_GROW(PI/2,L,X,Y,D)
 1260 ENDPROC
 1270 DEF PROC_GROW(TH,L,X,Y,D)
 1280 IF D MOVE X,Y ELSE ENDPROC
 1290 dX=L*COS(TH+dA)*(1/AR)
 1300 dY=L*SIN(TH+dA)*AR
 1310 PLOT 1,dX,dY
 1320 PROC_GROW(TH+dA+DT,L-DS,X+dX,Y+dY,
D-1)
 1330 MOVE X,Y
 1340 dX=L*COS(TH-dA)*(1/AR)
 1350 dY=L*SIN(TH-dA)*AR
 1360 PLOT 1,dX,dY:MOVE X,Y
 1370 PROC_GROW(TH-dA-DT,L-DS,X+dX,Y+dY,
D-1)
 1380 ENDPROC
```

Turn to Page 21 ▶

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MU4/87

Darwin and the micro

Christopher Payne talks to Richard Dawkins, the biomorphs' creator

Richard Dawkins is a lecturer in Zoology at Oxford University. He has written three books: The Selfish Gene, The Extended Phenotype and The Blind Watchmaker which, as Mike Cook reports on Page 18, was the subject of a fascinating Horizon documentary on BBC2 earlier this year.

And he has made great efforts to explain Darwinian theory in terms that everyone can understand – even to using computers to illustrate his points.

I started by asking Richard how he developed an interest in zoology.

"I was never much of a naturalist – I was more interested from the philosophical angle: How things came to be as they are. And the best way to get some answers is via science and biology.

What inspired you to write the book?

"It's so exciting to actually understand why we exist. I feel that people are missing something if they don't understand how they came to be here. The book isn't a biology textbook by any means – it's specifically written so that the non-technical person can appreciate it. It does have a slightly science fiction feel – that of a sense of wonder."

I noticed that the front cover of your book was painted by Desmond Morris. Is this the same person who wrote The Naked Ape and Manwatching?

"Yes, Desmond is a prolific painter of this type of surrealist painting as well as a biologist in the same field as myself.

"We've been professional colleagues for a number of years. He certainly views his artistic creativity as equally as important as his writing.

"Oxford University Press used one of his earlier paintings for the cover of my first book, The Selfish Gene, but this specific painting was inspired by the title, The Blind Watchmaker."

How did the documentary come about?

"Well, I did a Horizon film about a year ago called Nice Guys Finish First which worked very well.

"I gave a proof copy of The Blind Watchmaker to the same producer, Jeremy Taylor, and we actually started filming before the book came out. It took a few months to put together, during vacation time.

"We used a Commodore Amiga, programmed by Jeremy Ruston, to demonstrate the biomorphs and to produce the 3D landscape."

What kind of response have you had to the programme?

"I've received an awful lot of letters from young people who identify with computer-based ideas as they've been brought up with them.

"But I've also heard from retired people who like the book but who couldn't get to grips with the computer part of the documentary.

"With the latest generation of computers, which are so easy to use, the situation may change. But for the moment there are a lot of people who just switch off at the mention of computers – they don't even try.

"I've had lots of mail from creationists, too, those minds are deeply closed to evolution – many believe that God made the world 4,000 years ago.

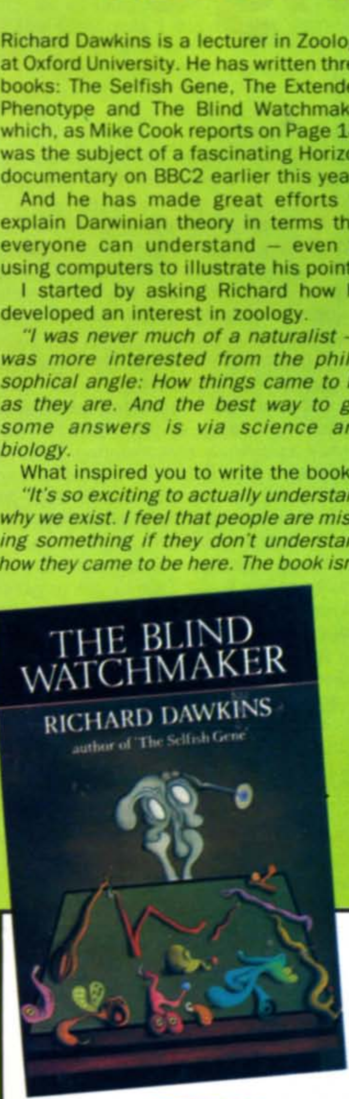
"However, there are plenty of people who are religious without being creationists – religion can provide many comforts without a devout belief in Genesis."

Many people accept evolution but don't see how life itself actually started from a primeval soup.

"There had to be a chemical event to give rise to the first self-replicating molecule.

"This was a random chemical event and a very improbable one – but there was a long time to wait and there are lots of planets where it could just as easily have happened.

"Other planets may have developed life-forms completely different from our own, but however different they may be they will all have developed by Darwinian principles."



EIGHT copies of The Blind Watchmaker to be won

ALL you have to do is type in the biomorph listings on the previous page, or buy the monthly tape or disc, and create an interesting biomorph of your own.

Bring it to the centre of the screen, press ? to copy down the values of the six genes.

Give it a name, such as Frog, Spitfire or Scarecrow, and fill in the rest of the entry form.

Send the form, or a photocopy, to the address below before April 30. A printout would help, but it's not essential.

Authors of the best eight designs will be sent a copy of this marvellous book worth £12.95.

ENTRY FORM

My name for the biomorph is: ____________________

The six gene values are: ____________________

Name ____________________

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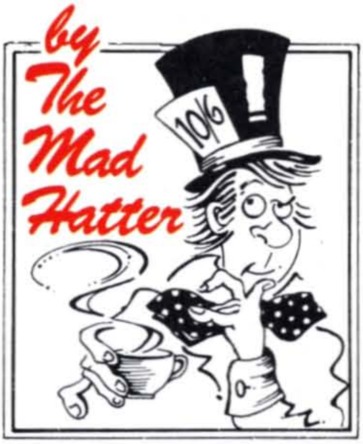


Enhanced Elite a real challenge

I'VE good news and bad news this month. First, the good news: The revamped Elite is superb: It's the only arcade game I have ever really bothered to play and I am pleased I bought the new issue.

At the time of writing I have just finished the first mission, so I am Dangerous again. This will be the third time I have journeyed along the road to Elite status.

I think I must have blasted that rogue ship in the first mission at least 100 times before it was destroyed and there were constant interruptions from pirate ships trying to finish me off. I strongly approve of the fact that the rogue is now energy bomb proof.

A word of warning though – this new version is not easy. Tactics have to be carefully planned in a way that was not needed in earlier versions.

I can no longer go bounty hunting and be reading a book at the same time, nor can I treat Thargoids quite as casually as I used to.

If you have the hardware to run the enhanced Elite, then I can certainly recommend it.

Now for the bad news: It looks as if Level 9 is dropping out of the BBC Micro scene.

There are two major reasons as I see it: Coding is no longer done on a BBC Micro and sales of the last two games were insufficient to make the exercise worthwhile. I suspect piracy has played a part here.

If like me you think this is a tragedy, I suggest you do two things.

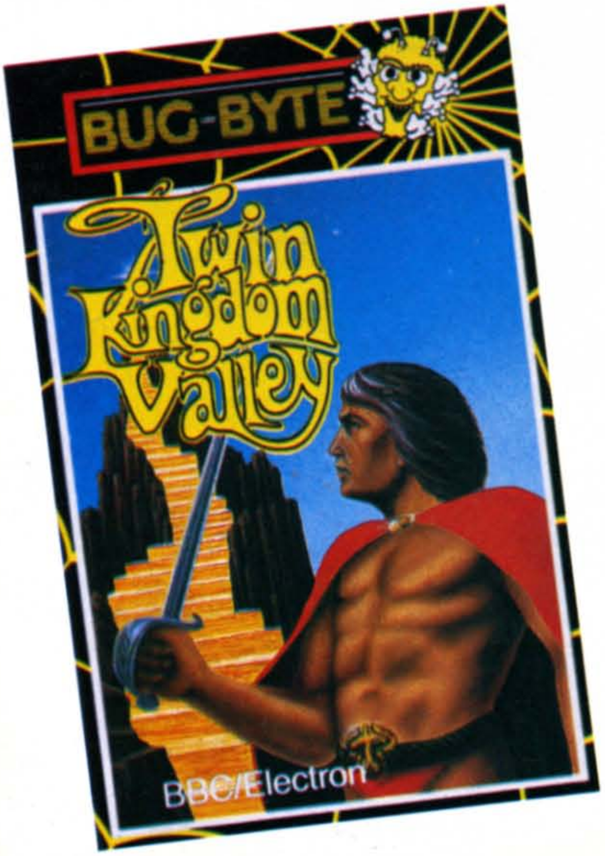
Let your views be made known in the Micromail pages of this magazine and write to John Austin assuring him that you are willing to buy Level 9 adventures in the future. His address is: P.O. Box 39, Weston-super-Mare, Avon BS24 9UR.

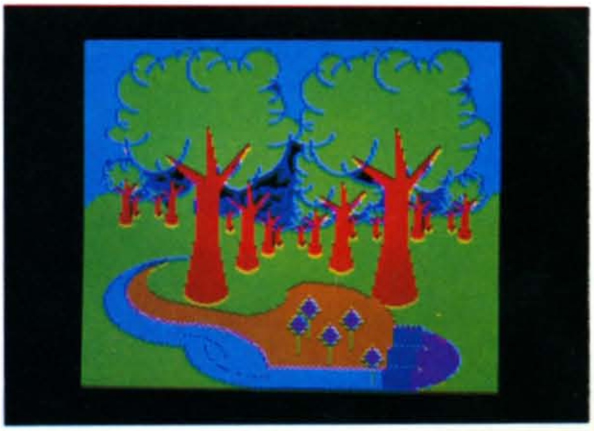
On a more cheerful note, I want to draw your attention to some of the features of Bug Byte's Twin Kingdom Valley. I was delighted to see it reissued a while ago at the bargain price of £3.

It was the first game giving a choice of playing formats – with pictures – that I came across for the BBC Micro .

You can have a picture drawn every time you visit a location, or only when you visit a new one. You can also choose between short or long text descriptions.

My own preferred format gave me a picture every time I visited a new location and the long text description, the best combination for preparing a map in





the way I do.

If there was no picture, I could soon find the location reference number on my map. If a picture was drawn, the location obviously needed a new number.

Twin Kingdom Valley has two sorts of maze: The sort I like coping with – and the sort I don't.

I coped with wandering through the mountains happily enough – charting the exit directions kept track of where I was. However, the other sort of maze forces me to say you must not do as I did: Do as I say instead.

The first time I played the game I bashed around at random in the twisty maze until I found the witch and established a trading position.

Then I blundered around the sloping maze until I got the message and a holdall. Now I've been back to map them properly.

It's amazing the way you can concatenate combinations of the words turny, twisty, little, maze and passages, while still providing a sensible description.

That of course is the key to the first maze. If you are desperate, I'll let you have the moves needed to confront the witch and get away; but you must write and ask, enclosing a stamped addressed envelope.

The Sloping Maze must be conquered in order to gaze upon the secret of life. Again, if you are desperate, write for help.

One key to solving Twin Kingdom Valley lies in just that. You have to find and use different keys which gradually increase your ability to open doors.

There are other tasks as well, but you won't solve the game without the master key – and obtaining that is not easy.

You start off with a brass key, can get a bronze one and must find a silver, a gold and finally the master key.

Only then can you move round freely – so long as you can see secret doors.

The other key to a successful conclusion lies in performing certain tasks in the right order. Basically it is necessary to choose a patron, either the Forest King or the Desert King. And it is essential to choose the correct one.

Once you are at his service, you can look after your own interests as well. You need to win friends, influence people, pick up treasures, slay inimical creatures and so on.

Twin Kingdom Valley was something of a landmark in adventure development. I am delighted that it is still around and I would be pleased to see any full (1024 points) solutions that readers can offer.

It's not always easy to find adventure games widely advertised, so let me state my preferred software houses, though please remember that this is a personal selection.

Top of my list is Level 9, P.O. Box 39, Weston-super-Mare, Avon BS24 9UR and close behind is Robico, 3 Fairland Close, Llantrisant, Mid Glamorgan, CF7 8QH

Next come Magus, 4 Toronto Close, Durrington, Worthing, West Sussex BN13 2TD) and Larsoft 4 Chantry Road, Clifton, Bristol BS8 2QD.

While others exist who have produced excellent adventure games, I have seen everything that these four have turned out and there's not been a dud among them. If you don't know their games, drop them a line.

Problem Corner

A. Strong is stuck in **Dr Who and the Mines of Terror:** I hope he saw N.J. Sharrat's exposition in the January 1987 Micromail, it may take him on a little.

Mark Hilton has penetrated **Philosophers Quest** in a most professional manner but still has a few problems with other adventures.

In **Pirate Adventure,** how can he get the doubloons without being killed by the snake?

Why does he die every time he tries pressing buttons in MicroPower's **Wizard's Challenge?**

Mark also can't keep hold of the talisman in **Kingdom of Hamil,** even though typing INVENTORY tells him he's still got it. Is this a bug?

Lastly, in **Ghost Town** he has the horseshoe and nails but where is the missing item (hammer?) to enable him to shoe the horse?

Mark does offer help with the **Kingdom of Hamil's** snark tunnel: Christopher Columbus went West; Peary went North; Scott travelled South and Marco Polo went East.

Combine the characters shown with the directions and you know where to go: Thus, if the mural shows Peary and Columbus, then the direction to go from the entrance to the snark tunnel is NW.

Helpline

A.D. Marter's problem in the November 1986 issue was getting started with ***Labyrinths of La Coshe.***

This has drawn replies from Simon Young who hacked his way into the program and Roger White, from my old University department, who played it straight and sent in a detailed analysis.

Simon wondered what the egg is for: Roger says you should leave it with the thief for a bit.

East of the forest clearing in ***Labyrinths*** is a necklace which forms the basis of a teleportation system. N and W of the clearing is a tree to be climbed.

And W of the clearing is a grating that can only be unlocked from underground.

Finally, several moves S from the clearing is a valley with a waterfall: The essential move here is THROUGH WATERFALL.

Roger is only 7% sane in ***Price of Magik,*** the best score I've seen so far, and I shall include extracts of his work on Labyrinths in a future column.

Andrew Armstrong has found a way to kill the Green Knight in ***Lord of the Rings,*** though he's not sure if it's the method intended.

Get the candle stub from the Mathom House in Michel Delving and take it to the monastery. Wear the ring, go W and enter KILL KNIGHT WITH STUB, repeating this until he's dead.

This may be a bug, or just a dreadful pun on candles and (k)night. Andrew had to wear the ring to enter the Mathom House; actually a visit to the mayor's office first means you can get in legitimately.

Matthew Hall has passed on tips for playing ***Erik the Viking.***

To get the crew, blow the horn. To set sail, push the ship, get in and go W. To escape from the mist, wave the tube. To escape from the maelstrom, throw the plug overboard.

To survive the sea dragon, climb the mast, enter the dragon's nose, go E and N, take the feather then go back. The dragon will let you go.

To enter the church, kneel and pray, when inside read the book. To enter the cairn, knock with the hammer. To enter the enchanter's maze, pull the tapestry.

To pass the eagle at gravel beach,

Turn to Page 24 ►

Helpline

◀ From Page 23

give mutton. To pass the icicles on iceberg ledge, light a fire. To stop the ship sinking, take the trestle tables, break them, take hammer and nails and enter MEND SHIP.

Two more readers are stuck in parts of ***Bored of the Rings.***

James Parker and Scott Walkinshaw both have problems with Old Man Willow. CRY HELP is the answer here.

What's the ring for? You need to place it somewhere to finish the game. HIDE is the proper route to the farm (where there is some ale) and the route further into the adventure. You have to enter the inn to get Arrogant.

I can't wait to see what the authors' joining forces with Level 9 produces in due course.

Harry Miller can't leave the first location in ***Philosophers Quest:*** Forget the cup of tea, take the aqualung, the keys and the rod, THROW ROD and go S.

Hall of Fame

Gary Smith has sent a map and full solution to **Castle of Riddles,** for which I am very grateful.

Stuart Swinton, a true Tolkein fan, has solved **Lord of the Rings Part 1** with neat, logical maps.

Now for Stuart Booth's conclusion to **Snowball.**

Jacob's Ladder (1): Leave the shovel for the moment and go to the base of Jacob's Ladder.

Open the toolbox, climb up the ladder and go north from the platform to the ledge covered in uni-slime.

Drop the cat (50), go back down Jacob's Ladder and take the shovel and get into the shuttle.

The snow-desic and the warehouse: Take the shuttle to the snow-desic and get the linked cylinders from the south corner. Take the shuttle to the warehouse. Take and wear the ceramic body armour. Now catch the shuttle to the snow dozer.

The snow dozer: Dig beside the snow dozer with the shovel and take the keys. Weld the track with the lance and linked cylinders. Enter the snow dozer, go down and take the fire extinguisher. Go up, turn the key and leave the snow dozer (100).

The shovel, keys, lance and linked cylinders have no further use and can be dropped. Enter the shuttle and take it all the way back to Jacob's Ladder.

Jacob's Ladder (2), the control room: Go back up Jacob's Ladder and up the Ramp to the T junction which looks risky. Wave the tray (50) and go to the old Control Room.

Take the electro flute and fire extinguisher from the tray. Blow the electro flute then press the extinguisher (50).

Attach the flask for extra air, if you have not already done so (50), then go to the New Control Room beside the panel and pull the lever (50).

As Stuart says, That's it . . . except . . . he has drawn some very good maps of the different areas, so again (as space permits) I will include them in the column.

● *See you next month. Until then, happy adventuring.*

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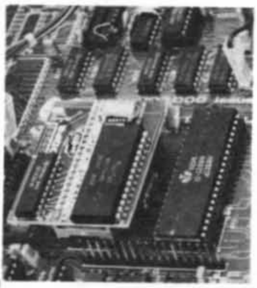

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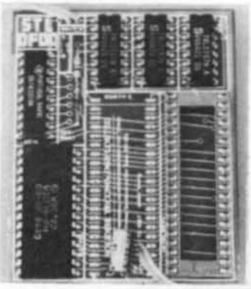

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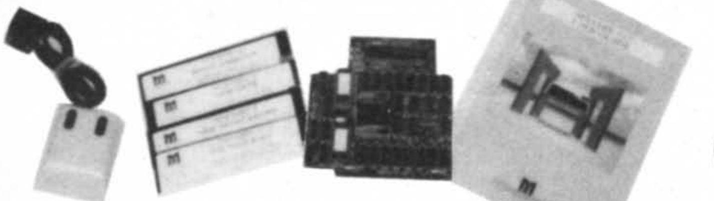
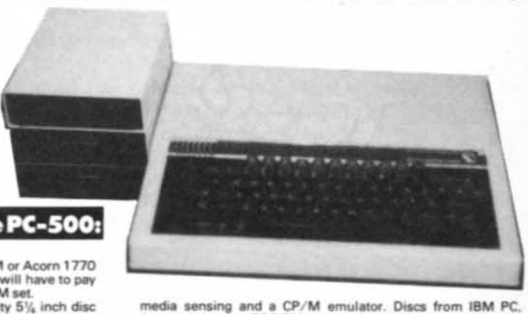
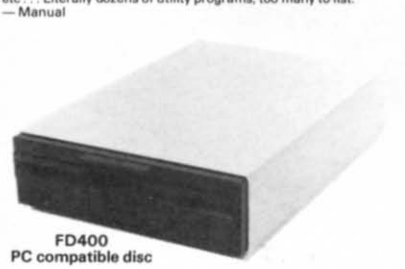




THE PC-500 consists of a Master 512 Internal Upgrade and a Tube adapter, all housed in the same case as a standard half-height disc drive. It's easy to stack the PC-500 on top or under your 5¼ inch disc drives.
Connecting the PC-500 to the Beeb is by means of 24 inches of flat ribbon to the Tube connector, like the Z80 or 6502 second processors. An ON/OFF switch and indicator are also included.

What you get for £239:

— 80186 CPU running at a clock speed of 10MHz.
— 512K RAM, 16K ROM.
— Mouse.
— 4 discs (80 track double sided, double density) containing DOS+, the GEM collection, Winchester initialiser, RAM disc, CP/M emulator, file transfer and format conversion programs etc . . . Literally dozens of utility programs, too many to list.
— Manual



FD400
PC compatible disc

What you need to run the PC-500:

— BBC issue 3 to 7, MOS 1.2.
— Solidisk DDFS or DFDC with 2.1 ADFS ROM or Acorn 1770 with ADFS. Opus 1770 Double Density users will have to pay £20 extra for Solidisk ADFS version 2.1 OP ROM set.
— TWIN 80 track, double sided, double density 5¼ inch disc drives (Mitsubishi, NEC, TEAC, Matsushita or Sanyo). You may use the Solidisk 3.5" drives but will have to pay extra for disc copying service (£10 for 4 discs). 40 track double sided drives will require a special solidisk ADFS ROM set (Version 2.1PC, £25) and disc copying service.
— Solidisk Real time Clock (£30). DOS+ will take date and time directly from the RTC instead of prompting you each time.

Software that runs and software that don't:

The majority of PC and CP/M software (40,000+ titles) for both the 8088 (and family) and the Z80 will run. All generic software (MSDOS 2.1, DOS+ and CP/M 2.2) eg Wordstar, DBASE 2, Supercalc etc will run, special machine dependent packages won't (eg Locoscript on the Amstrad PCW's). File transfer is even better, you can copy, edit or process files from virtually any kind of discs, from IBM to Amstrad, provided that you have suitable disc drives. Extra software may be needed in some cases.
Ring Solidisk Technical for advice.

DOS+ and the GEM collection:

DOS PLUS is becoming the dominating Disc Operating software for 16 bit computers. It is media compatible with PC DOS and MS DOS (2.1). Furthermore, Acorn's implementation has automatic media sensing and a CP/M emulator. Discs from IBM PC, Amstrad, Apricot, BBC Z80 etc. can be read on your computer, and copied into your format. The GEM collection consists of GEM WRITE (a wordprocessor), GEM PAINT (a graphic drawing and painting program) and GEM DESKTOP (a mouse driven disc menu).

Compatible Disc Drives:

Two problems: disc size (5¼, 3.5 and 3 inch) and disc format (single and double density, 40 and 80 tracks, single and double sided). You can READ and WRITE 40-track discs with an 80-track drive. But if a 40-track disc is written to by an 80-track drive, the resulting disc cannot be READ reliably on a true 40-track drive. The 40/80 track switch that you may have on your 80-track drive will not help, because true 40 track read/write heads have a gap nearly twice as large by comparison. If you have to write to IBM PC discs, you will have to buy a compatible drive such as the Solidisk FD400 series (£109).

Public Domain Software:

Solidisk's PC unit is setting up a Public Domain Software User Group to provide PC-500 users with an inexpensive source of Public Domaine Software and Shareware. First year membership is free to all PC-500 owners. PDS discs and manuals are available at the same prices as with Solidisk Sideways RAM software.

SOLIDISK SALE

Electron Disc Interface:

This unit (EFS) plugs into the PLUS-1 Expansion and allows connection of a twin disc drive system and a Winchester. The Disc Interface is based on the same WD1770 chip as used on the Beeb.
The Electron Disc Filing System software in ROM (32K) is a version of the Solidisk ADFS 2.1 thus offers a large degree of compatibility with Beeb software. The system is capable of both Beeb DFS format (single and double density) and ADFS format as used on the Acorn PLUS-3. The unit also has a 16K of Sideways RAM which can be used to load ROM images. The unit is guaranteed for one full year but we warn the users that the built-in Sideways RAM is UNRELIABLE hence the reduced price of only: **£50.00**
Use a disc system with built-in power supply unit.

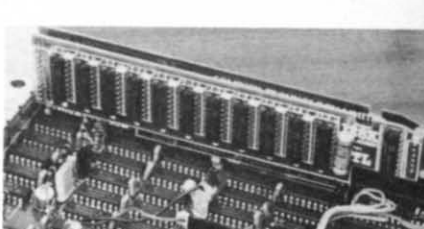
Old Style SWR32 and 128K:

This exceedingly popular system (30,000 plus units sold) enables the Beeb user to load one or two ROM images into the Beeb, make a 16K printer buffer, use DFS with PAGE at &E00, play games, run bigger BASIC, store music and inumerable other uses as supported by a library of 15 software diskettes.
The SWR32 system consists of a BASE UNIT which plugs into the rightmost ROM socket on the BBC board and a (exchangeable) RAM CARD. The RAM CARD also has extension socket for a piggy-back memory board capable of bringing the extra memory to 128K bytes of RAM.
This system is now superseded by the new FOURMEG series and therefore offered at a knock-down price of **ONLY £20.00** for a complete unit, excluding software. The 96K add-on piggy-back memory board is also greatly reduced.
Order as SWR32 .... **£20.00**
Order as SWR128 (SWR32 with 96K extension) **£50.00**
NB: Manual supplied but software (not strictly required) not included.

The supportive software is a series of 15 diskettes, available on either 40 or 80 track DFS diskettes. You can buy any number of VOLUMES although we recommend you buy by PACK of FIVE volumes. PACK 1 (volumes 1 to 5) contains general applications such as MENU, PRINTER, DFSOE00, SILEXICON etc. PACK 2 contains programming applications (SOLIMON, SOLITRACE, TELETEXT EDITOR, SPRITES, DFS and ADFS etc). PACK 3 contains exclusively computer games. Each diskette is priced at only £2.00, software PACK is £10.00 for 5 diskettes.
Order as VOL. XX **£2.00**
Order as SOFT/PACK 1 or 2 or 3 .... **£10.00**

Secondhand Refurbished Beebs:

As a result of the Solidisk MASTERPLAN, we have to dispose regularly of SECONDHAND, refurbished, complete with Double Density DISC INTERFACE, thoroughly checked and fully guaranteed (Labour only) BBC Model B's. Price vary with issues and ages, commencing from £150.00. Please ring.



SOLIDISK TECHNOLOGY LIMITED, 17 SWEYNE AVE, SOUTHEND-ON-SEA, ESSEX SS2 6JQ. TEL. SOUTHEND (0702) 354674 (16 lines).

BEEB EXPANSION

SOLIDISK FOURMEG 256K

The memory limit on the BBC micro can now be definitely a thing of the past. The new Solidisk Fourmeg board offers all you could wish for. It has 256K of extra RAM, a superfast 4MHz CMOS processor, sophisticated memory management sockets for high capacity ROMs and 32K of software in ROM. It is compatible with most hardware add-ons — except Sideways ROM expansion — which it replaces.

Fitting is easy. You remove the existing processor from its socket and plug the new board in its place, push on three colour-coded wires, clip on two mini hooks and its ready. Switch on the computer and you will immediately see the difference.

The message "Solidisk 256K expansion (4MHz)" announces the new memory size and speed.

A switch at the back lets you select between the old (2MHz) and the new (4MHz) speed.

The BBC micro at 4MHz easily surpasses the new Master 128K on benchmarks.

For example, it runs the benchmark using Basic 4 in only half the time taken on the Master 128K.

If you have too many Roms to plug in at once, the Fourmeg 256 offers two ways out. Firstly, it includes additional high capacity (and fast) ROM sockets. Moreover, two four normal ROM images can be stored in one high capacity ROM chip (by "vertical paging") — so more can be made immediately available to your fingertips.

Secondly, ROM images can be stored on disks and loaded into any one of the eight Sideways Ram banks available. If you need more room in "languages" such as VIEW or BASIC, you may use any of the eight SHADOW RAM banks. No user memory is then lost to the screen, whatever the screen mode.

You can turn the extra memory into a RAMDISC or a printer buffer by simple star commands. A Silicon disk of 200K, compatible with both the Solidisk DFS and ADFS formats replaces then one of the 4 physical disc drives. The Ramdisk is at least 10 times faster than physical disk drives and has no moving parts. The printer buffer saves you time, it lets you use the computer while feeding your printer in the background.

It is the most logical next step for owners of any Sideways ROM board or Solidisk Sideways Ram, who can trade in their present boards for the excellent Fourmeg 256.

To complement such a powerful product, Solidisk recommend Computer Concepts Wordwise Plus and Interword.

BEEB 256 PRICES:

TWO MEG 256, 16K MANAGER ROM	£115.00
TWO MEG 256, WITH WORDWISE +	£145.00
TWO MEG 256, WITH INTERWORD	£165.00
FOURMEG 256, WITH WORDWISE+	£165.00
FOURMEG 256, WITH INTERWORD	£185.00
ROM board TRADE IN discount	£30.00
Post and packing	£2.00

Shadow Sideways ROM and Sideways RAM All in One for £50:

This board, the TWOMEG 32K, is specifically designed with the school BEEB in mind so that one can have everything required on a single, compact and extremely easy to install unit. All the necessary software is in a MANAGER ROM (supplied).

The top row of five ROM sockets will take software ROMs, up to 32K each, such as used on the BBC Plus and the MASTER 128K.

The middle row contains 32K of additional CMOS, low power RAM, acting as Shadow Ram or as two banks of Sideways Ram.

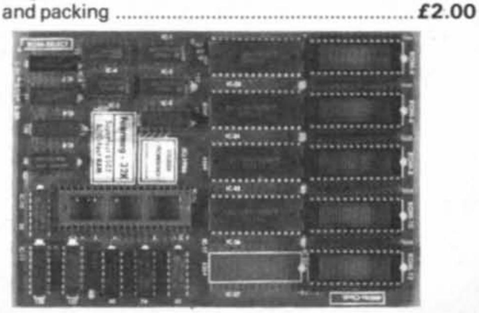
The empty 40 pin socket will receive either the normal 2MHz CPU or the optional enhanced, faster 4MHz CMOS 6502 (the board will then be called the FOURMEG 32K).

The TWOMEG 32K combines the usual functions of a Sideways ROM board — offering storage for up to 160K on board and 64K on the BEEB itself (a total of 224K out of 256K possible) and a SHADOW RAM compatible with major language ROMs such as BASIC, VIEW, WORDWISE, INTERWORD, VIEWSHEET, VIEWSTORE etc.

When Shadow Ram is in use, a small 8K of Sideways RAM is available for loading ROM images or a small printer buffer. When SHADOW RAM is not in use, the entire 32K additional RAM can be used as two banks of SIDEWAYS RAM or as a RAMDISC (available only with Solidisk DFS or ADFS). The Manager ROM also contains a Toolkit to assist programming in BASIC.

The attraction of the TWOMEG-32K board comes from its versatility, its convenient software in ROM and its low pricetag. Furthermore, the board can be fitted with a CMOS 65C02 capable for example of running the new BASIC 4 (some 30 per cent faster than BASIC 2 and also more accurate) or upgraded to FOURMEG speed, comparable to the TURBO board on the Master.

Twomeg 32K	£50.00
65C02 (2MHz) for the above	£10.00
Or upgrade to fourmeg	£25.00
Fourmeg 32K	£70.00
Post and packing	£2.00



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MASTER SERIES:

AMB15	Master 128	499.00
ADB12	Master ET	399.00
ADC06	Turbo Upgrade	125
ADC08	80126/512K	228.00
ADF13	Eprom cartridge	14.95

MANUALS AND DOCUMENTATION:

ADJ22	Ref manual Pt 1	14.95
ADJ23	Ref manual Pt 2	14.95

MASTER COMPACT SERIES:

ADB20	Master Compact Single drive	441.25
ADB20+ADF30	Master Compact S/D with TV mod.	457.35
ADB20+ADF31	Master Compact S/D with Mono monitor	537.85
ADB20+ADF32	Master Compact S/D with Colour monitor	687.35
ADF15	RS232 kit	29.90
ADF16	Second 3.5" floppy drive	113.85
ADF17	PAL TV Adaptor	29.90

ACORN SOFTWARE:

SUB27	Viewstore database ROM	59.80
SUB18	Pascal	69.00
	FORTH	19.90
	LISP	19.90
	MICRO-PROLOG	79.95

SOLIDISK SOFTWARE ROMS:

PCFS	Compatible with PC and MS DOS discs	15.00
PCMAN	MANUAL FOR PCFS	5.00
CDFS	single and double density DFS ROM for the COMPACT	10.00
MADFS	DFS and ADFS ROM (32k) for the Master	20.00
LMS	communication ROM for the Master	10.00
SOLIMON	Machine code monitor for Master/Compact	10.00
INSIGHT	Intelligent disassembler, XREF	20.00
UVP	Eprom programmer software (8k)	5.00

ECONET PRODUCTS:

ADF10	Econet plug-in	49.99
AEH17	100m Cable	99.00
AEH18	10station lead set	29.00
AEH19	Econet starter kit	99.00
AEH20	Econet bridge	199.00
AEH21	Econet socket kit	29.95
AES21	Level 2 Fileserver	249.00
AES22	Printer server ROM	49.00

DISC DRIVES:

FD35	3.5" 80-track double-sided single drive	£100.00
TWIN35	Twin DF35	£200.00
FD525	5.25" 80-track double-sided single drive	£115.00
TWIN525	Twin FD525	£230.00
20MB	Winchester new model, low cost SEAGATE	£700.00

PRINTERS:

LX86	EPSON LX86 + 2M printer lead	249.00
LXTF	LX80 Tractor Feed	31.30
LXCSF	LX80 Cut Sheet Feeder	53.53
FX85	EPSON FX85 NLQ + 2M printer lead	350.00
FXTF	FX85 Tractor Feed	30.59
FXCSF	FX85 Cut Sheet Feeder	123.50
NL10	STAR 80 col-120 cps par. 2M lead	289.00
NLCSF	Cut Sheet Feeder for NL-10	59.99
NLRIB	Black Ribbon for NL 10	5.64
MP165	Tractor and pich feed, 165 cps, NLQ, 2M printer lead, exceptional value	260.00
EPSRIB	Black ribbon for Epson and MP165	4.00
J6100	JUKI 6100 Daisy Wheel + 2M printer lead	340.00
JURIB	JUKI 6100 black vinyl printer ribbon	2.00
PAPER	2000 sheets cont. paper, A4 size 11" x 9.5"	14.00

MONITORS:

BM7502	12" Philips hi-res green screen, lead	85.00
BM7522	12" Philips hi-res amber screen, lead	86.00
CM8533	14" hi-res Colour Monitor, lead	299.00
TAXAN3	12" TAXAN Supervision 3, hi-res RGB Colour, lead	375.00
TAXAN2	12" TAXAN Supervision 2, Merdium-res RGB Colour monitor, lead	315.00
XC1404	14" Mitsubishi RGB colour monitor, lead	260.00

SOFTWARE PACKS:

SWPK1	5 software discs, 80 track. Database, spelling checker, machine code monitor, Macro Basic etc. 5.25" format	£10.00
	3.5" format	£15.00
SWPK2	5 software discs, 80 track. Games. 5.25" format	£10.00
	3.5" format	£15.00

DISKETTES:

MD525	5¼" low cost VEREX for all drives	.12.00
MD557	5¼" hi-rel MD557, Verbatim DSDD 96tpi	25.00
C102	3.5" low cost Verbatim for all drives	20.00
C103	3.5" hi-rel 90097M Vertbatim DSDD 135 tpi	28.00
C104	3" CF2/MSOFT for all Amstrad drives	39.00

CARTRIDGES:

ADF13	Acorn Eprom cartridge for two 27128	14.95
EPR32	Solidisk Eprom cartridge for one 27256	8.00
RAM32	Solidisk 32K RAM cartridge with battery backup and write protect switch	25.00
MEGA256	Solidisk 256K Mega-RAM card with RAM disc and printer buffer in ROM	100.00
MEGA256	Solidisk 1 Megabyte Mega-RAM card with RAM disc and printer buffer in ROM	POA
	Expected price in April/May	225.00

EXTRA DISCOUNT

If you buy a disc drive or a printer or a monitor at the same time you buy a Master or a Compact, you are qualified for SYSTEM DISCOUNT and a free Software Pack 1 (worth £10.00 or more).

Normal Package Price	System Discount	Reduction
£600-£699	3%	£18-£21
£700-£799	4%	£28-£32
£800-£899	5%	£40-£45
£900-£999	6%	£54-£60
£1000 and above	7%	£70-£££

Example of system		normal price	Discount	Net price
1	Compact Mono + MP165 printer	797.85	31.95	**765.94**
2	Compact Colour + Juki 6100	1027.35	71.89	**955.11**
3	Master 128 + twin F/Drives	729.00	29.16	**699.84**
4	Master 128, twin F/Drives, CM8533 Colour monitor	1028.00	71.96	**956.04**
5	example 4 + MP165 printer	1288.00	90.15	**1197-84**
6	Master 512 + twin F/Drives	957.00	57.42	**899.58**
7	Master 512 + twin F/Drives, plus 20 MB Winchester	1657.00	115.99	**1541.01**

SECONDHAND BEEB AND UPGRADE TO MASTER:

We buy and sell good condition second hand Beebs, even by post. Proof of original purchase is required if you are only selling your computer. Reduced commission is available if you are UPGRADING your BBC to a Master, ask for a MASTERPLAN quotation.

BBC Model	we buy at	we sell at
B-issue 2	131	175
B-issue 3	191	225
B-issue 4	187	250
B-issue 7	225	300

The prices above are given as average for very clean and good condition machines. Please ring for stock allocation before you call.

ORDERING BY POST:

All items can be ordered by post, sending the coupon below and enclosing cheques, POs, drafts or credit card numbers or by phone. P and P is charged as follows:
Less than 1 KG (eg software, cartridges and books): **£2.00**
Up to 3 KGs (eg single disc drives): **£3.00**
Up to 10 KGs (eg computer, monitors, printers, twin disc drives): you can specify either parcel post £6.00 or courrier/Datapost: **£12.00.**
Above 10KGs (eg complete system), please either allow generously or give us a ring for quotation.

ORDER FORM

Please fill and send to:

Solidisk Technology Ltd
17 Sweyne Avenue
Southend-on-Sea, Essex SS2 6JQ

Name: ....

Address: ....

....

....

Items: ....

Price: .... P & P: £2/£3/£6/£12

Total: ....

Access/Barclay:

☐☐☐☐ ☐☐☐ ☐☐☐ ☐☐

Solidisk Technology Limited, 17 Sweyne Ave, Southend-on-Sea, Essex SS2 6JQ.
Tel: Southend (0702) 354674 (16 lines).

OFFICIAL DEALERS IN ESSEX

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ACORN SPECIALIST COMPUTER CENTRE

All our prices include VAT.

APPOINTED WATFORD DEALER

Micromam has been appointed a Watford Dealer. We are stocking a large range of Watford products, including the popular BEEB DIGITIZER, MAGAZINE MAKER, 32K SHADOW RAM CARD, RAM/ROM CARDS, DFS UPGRADES and many more available from our shop.

BBC MASTER SERIES	
Master 128	475.00
Master Turbo Module	125.00
Master 512 Upgrade	228.85

BBC MASTER COMPACT SERIES	
Master Compact + TV Modulator	458.85
Master Compact + Green Monitor	539.35
Master Compact + Colour Monitor	688.85
Compact ViewSheet	59.80
Compact ViewStore	59.80
A selection of games	call for prices

ACORN PERIPHERALS	
800K Dual Disc Drive + Stand	316.00
Prestel Receiver	139.00
IEEE Interface	325.00

BBC B DISC INTERFACES	
Acorn 1770 Disc Interface	49.95
Acorn ADFS ROM	29.99
Watford Single Density DFS	69.00

RAM/ROM SHADOW EXPANSION	
Watford Solderless ROM Board	36.80
Aries B12 Sideways ROM Board	46.00
Watford Shadow Board	67.85
Aries B32 RAM Extension Board	92.00
ATPL Sidewide ROM Board	43.70

EPROM PROGRAMMERS/ERASERS	
Control Telemetry Eprom Prog.	109.25
Uviprom EPROM Prog.	20.95
Uviprom EPROM Prog. + ZIF	25.95
Multiprom Programmer	44.95
Please note - Uviprom Programmer software extra.	
Uviprom ROM Software	5.00
Uviprom SWR Disc Software	2.00
Uvipac EPROM Eraser	20.95
Uvipac EPROM Eraser + Timer	25.95

EPROMS/RAM	
Eprom 2764 8K	2.95
Eproms 27128 16K	3.45
27128 per 5 Eproms	16.50
RAM 6264 LP-15 8K	3.95
27256 (12.5v)	5.95
27512 (12.5v)	9.95

MONITORS (inc BBC CABLE)	
Microvitec 1421 Std/Metal	229.00
Microvitec 1451 Med/Metal	279.00
Philips CMB8533 Med/RGB/CV	299.00
PHilips Green 7502	85.00
Philips Amber 7522	89.00
Philips White 7542	89.00

MODEMS/COMMUNICATIONS	
Pace Nightingale + Commstar II	P.O.A. 99.00

PRINTERS (inc FREE BBC CABLE)	
Canon PW1080A	289.00
Panasonic KX-P1080	179.00
Star NL10 + BBC/Cent Interface	278.00
Star NL10 Sheet Feeder	63.25
Juki 6100 Daisywheel	299.00

PLOTTERS	
Roland DXY-880A A3 Plotter	835.00
Roland DXY-980A A3 Plotter	1207.50
Epson HI80 Plotter (4 pen)	458.85
Hitachi 672	595.00
Microman Plotter ROM	29.95

LOW COST A4 PLOTTER PACKAGE

PL 80 A4 4pen Plotter (DXY type commands) 0.2mm resolution, plus **FREE MICROMAN PLOTTER ROM** (produces plots from Viewplot, Interchart, etc.), plus BBC Cable

- All for only £189.00

DIGITISERS	
Graphpad II	75.50
Cherry Digitiser	632.50

BBC CAD SYSTEMS	
Bitstik 1	375.00
Bitstik Multi-plotter Driver	79.00
Bitstik 2 (Master compatible)	799.00
Bitstik 2 Upgrade	460.00
Pineapple Diagram (40T Disc)	28.75
Pineapple Diagram (80T Disc)	28.75
Pineapple PCB Designer	97.75
Novacad Trackerball Compatible	113.85
Novacad Plotter Utilities	32.78

OPUS DISC DRIVES

OPUS 5802 400K 40/80T/DS

£109.95

OPUS 5802D 800K 40/80T/DS

£209.95

OPUS 5802D 800K 40/80T/DS including PSU

£239.95

MOUSE/TRACKERBALL PRODUCTS	
AMX Mouse +Free Watford Art	79.95
AMX Mouse: Master Version	79.95
AMX Pagemaker	49.95
AMX Pagemaker: Master Version	49.95
AMX Max	19.95
AMX Super Art ROM	49.95
AMX Super Art ROM: (Master Version)	49.95
AMX Cad	69.95
AMX Extra Extra	24.95
Fleet Street Editor	39.95
Fleet Street Editor Utilities	14.95
Trackerball RB2 +ICON Soft	69.95
Trackerball + Pointer (Master)	69.95
Pointer ROM	14.37
Trackerball/Mouse Interface	9.20

VIDEO DIGITISERS	
Watford BEEB Video Digitiser	126.50
Watford Magazine Maker	148.35

WORD-PROCESSORS + UTILITIES	
View 2.1 ROM	52.00
View 3.0 ROM	79.00
Viewspell ROM	39.95
Interword ROM	49.00
Wordwise Plus ROM	49.00
Watford Word-Aid	27.60

FONT/NLQ UTILITIES	
Watford NLQ ROM for Epson	28.75
Clares Fontwise (Disc)	12.00
Clares Fontwise Plus (Disc)	20.00
Clares Fonteditor (Disc)	20.00
Fontaid ROM	30.00
Fontaid Utilities Disc A	15.00
Fontaid Utilities Disc B	15.00
Multi-Font NLQ	30.00

DATABASES + UTILITIES	
Viewstore ROM	52.00
Acorn Database (Disc)	15.35
Masterfile II (Disc)	22.00
Betabase	25.00

SPREADSHEETS/CHARTS	
Viewsheet ROM	52.00
Viewplot ROM	29.95
Intersheet ROM	49.95
Interchart ROM	33.95

PANASONIC KX-P1080 PRINTER

This well-built printer offers many advanced features. It provides both friction and tractor feed NLQ as well as draft modes and full Epson code compatibility. This special offer includes a BBC Cable.

£179.00

LANGUAGES	
BCPL ROM	59.80
BCPL Calculations	34.50
BCPL Stand Alone Generator	49.90
ISO Pascal ROM	59.95
ISO Pascal Stand Alone Gen.	34.50
Comal ROM	49.85
Acorn LOGO ROM	69.00
Logotron LOGO ROM	69.00
Micro-Prolog ROM	79.95

UTILITIES	
Acorn Basic Editor ROM	29.90
Acorn Termulator ROM	34.50
Acorn Graphics Ext. ROM	29.90
Computer Concepts	Full range
Beebug	Full range
Caretaker Basic Utility ROM	33.35
	52.90
	56.35
Slave Plus ROM	39.95
Floppywise Plus ROM	29.95
Proc-Kit (Disc)	10.95
Loc-Kit (Disc)	25.00
Vine Replay ROM's	35.00
Vine TD ROM	18.00
Clares Profile Disc	12.00
Clares BROM Plus	30.00
Clares Ramrod ROM	40.00
Watford The Investigator	23.00
Watford Dumpout 3 ROM	28.75
CJE Inform	20.00
Moviemaker ROM	29.90
Supergraph	28.75
Pineapple Compiler	28.75

VIGLEN PRODUCTS	
Viglen Console, Cartridge System and Printer Stand	P.O.A.

PC SHOWROOM

With the launch of the Amstrad PC1512 and Opus PC II, we are opening a new showroom for the sales of PC compatible computers, add-on card, hard discs, printers and software. The showroom is adjacent to our existing shop and we welcome our existing and new customers to visit us and have an opportunity to see and use this new range of machines and software.

We will be stocking the range of Amstrad PC1512, Opus PC II and Tandon computers along with software titles such as VP Planner, VP Info, Executive Writer, Supercalc 3, Wordstar 1512, Word Junior and many more applications.

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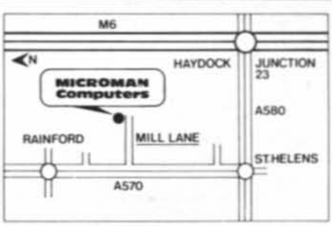
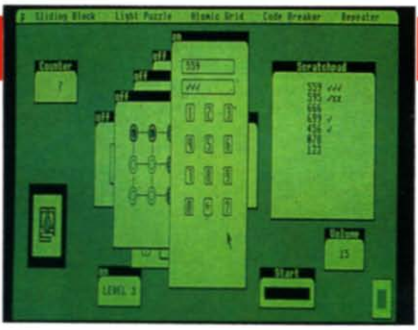


★★★★★ Excellent
★★★★ Worth buying
★★★ Only average
★★ Could do better
★ Give it a miss

Mind games

★★★★★



THIS is a suite of five games for you to play – provided you have the AMX rom and a suitable mouse.

When you boot up the disc you are presented with a complex screen in the usual AMX style.

While the display is in monochrome, the base colour can be chosen from the usual eight colours by clicking the mouse over the rectangular window in the bottom right corner.

Just above this is a square labelled volume, containing a number between 0 and 15. Clicking this will reduce the volume of sound from 15 to 0 in single unit steps.

Other windows control the start of each game and the level of difficulty chosen, while others display a counter of the number of moves taken and a scratchpad area that is used for one of the games: The centre of the screen contains the current game window.

Each game has a different shape window that only partly overlays the others, so that each of the five has a small area visible at all times. A game is selected by clicking over its name on the menu bar at the top of the screen.

The first game is a sliding block puzzle. In a 4x4 grid are 15 blocks numbered one to 15.

When you click the start window the computer shuffles the blocks as though sliding one at a time into the empty space provided by moving the previous block. Depending on the level chosen, it will make more or less moves.

The aim is to restore the original pattern in as few moves as possible. But although the computer shows you its moves, it carries them out so quickly that you cannot follow the sequence.

With this game, as with all the others, you are rewarded with a fanfare on successful completion.

Next comes a light puzzle in which a 3x3 grid of lights is displayed. Clicking on any light will switch it, and several others, on or off in a predetermined pattern.

At the start of the game the computer selects a random pattern of lights and your task is to create the final pattern: All lights out except the centre one.

Although it sounds a simple game it's quite a challenge to solve the puzzle in relatively few moves.

The third game is called atomic grid.

The aim is to use the move button on the mouse to collect a symbol from its home and place it on the correct square on a 4x5 grid, under which the computer has hidden another symbol.

To help you there is a way of inquiring which row or column the hidden prize is located in. At the lowest level this game is very easy, but when three symbols are hidden it is quite challenging.

The code-breaker game is based on the Mastermind game seen in the shops a few years ago – nothing to do with the television programme.

Here the display is a little like a calculator: At the top are two lines of blanks, below which is a numeric keypad (zero to nine) with query and backspace buttons.

The computer selects a hidden code number, which the contestant tries to match in as few attempts as possible.

By clicking over the numeric keypad, numbers are displayed in the top row of blanks in sequence.

When all the blanks are filled the computer checks the proposed code number against its own selection, displaying the results of the comparison on the scratchpad.

A tick represents a digit correctly matched for value and position while a cross tells the contestant that a number has matched in value, but not in position.

If you give up, you can click on the query to reveal the hidden code number.

Although it's relatively easy with three digit code numbers, this game becomes infuriatingly difficult with nine digit codes.

The final game is very simple in concept, based on the electronic game Simon and its many clones.

The computer lights one of four buttons and sounds a correspondingly pitched note. You are expected to copy by clicking the correct button, thus sounding the correct note.

Each time you get it right the computer adds another button to the sequence, so you quickly find yourself trying to repeat sequences of 10 or 15 notes.

The components of Mind Games are simple in concept but varied in difficulty.

At their higher levels the games should challenge even the best among us, while at the simpler level they should still provide a challenge to younger children.

The use of the mouse environment is well executed and I found the whole package a joy to use.

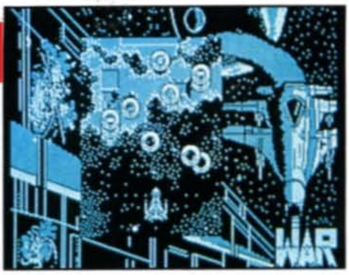
It's a pity that you cannot skip from one game to another and retain the last score so that you can return where you left off. However, I can fully recommend Mind Games to all ages.

Ian Whitmore

Price: £14.95 (disc). Supplier: Advanced Memory Systems, 166/170 Wilderspool Causeway, Warrington. WA4 6QA. Tel: 0925 413501

W.A.R

★★★★



WORMING its way through space is a long chain of gigantic cylinders, an artificial world inhabited by alien beings.

As usual the aliens are bent on destroying the Earth and all its inhabitants. In a moment of bravado you foolishly volunteer to attack and destroy the alien planet.

W.A.R uses the screen in an unusual way: The title screen is retained once the game has loaded and a small window opens up within it.

This vertical rectangle is the playing area, and although it appears to be impossibly small you soon forget its dimensions as you get on with the job at hand – mindless destruction.

Your task is to strafe each cylinder to render most of its ground installations inoperative. Once a cylinder has been immobilised in this way you move on to the next and start again.

After about five cylinders the sequence repeats itself – with no increase in difficulty.

The graphics are high resolution black and white, the ships and backgrounds are highly detailed and smoothly animated.

All ground installations are shown as shaded squares and must be destroyed: Anything taller than a shaded square is to be avoided. The background features are given depth by clever use of shadow.

The cylinders are defended by four types of droid, each having a different movement pattern or speed of attack. Your ship can manoeuvre in all four directions as you fly over the scrolling background.

By moving to the very bottom of the screen you can gain that extra fraction of a second needed to dodge or destroy an aggressor.

I would like to take this opportunity to thank the programmer for providing such a rapid rate of fire when the appropriate key is held down.

The first set of screens can be mastered with about 30 minutes practice. The reverse of the cassette contains a new set, which are made more difficult than the first by the inclusion of a large number of obstacles.

Rather unsportingly Martech gives you no way of distinguishing between flat and raised objects so you spend a great deal of time exploding for no apparent reason – this soon becomes intensely annoying.

W.A.R is a good game which has difficulty levels of two extremes. Had Martech pitched the difficulty level somewhere in between it would have been a stunner.

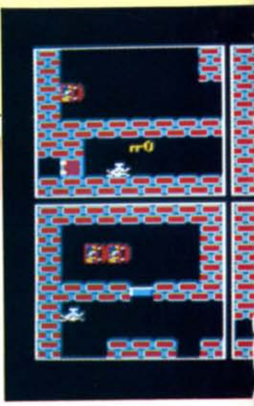
Jon Revis

Price: £8.95 (cassette) £12.95 (disc). Supplier: Martech, Martech House, Bay Terrace, Pevensey Bay, East Sussex BN24 6EE. Tel: 0323 768456

★★★★★ Excellent
★★★★ Worth buying
★★★ Only average
★★ Could do better
★ Give it a miss

Dunjunz

★★★★



MACKSCRANE, the Great Demon, has stolen the chalice of binding and hidden it deep within the Dunjunz.

Four fearless adventurers must risk their lives to save the chalice... and the world.

Dunjunz is the arcade/adventure game to top them all.

It is based around a dungeons and dragons type scenario in which up to four players compete simultaneously.

This is achieved by dividing the screen into four separate action windows, all of them looking into the same dungeon, but each showing the progress of one particular adventurer.

This system enables groups of players to explore the dungeon as a fighting unit, protecting each other against attack by the guards, increasing their fire power when destroying objects or even killing each other.

The adventurers are provided in four different guises: The Ranger uses a magic bow, the Wizard is hot stuff with a fireball, the Barbarian is an axe-wielding maniac and the Warrior is a mean swordswoman.

The weapons all have different attack values – the higher the value the greater the damage inflicted with each blow.

This value is increased if the adventurer locates the magic sword or a pile of weapons.

Similarly each character's armour has different values: The Warrior's chain mail and shield offer great protection from most blows, but not so the Ranger's robe which is of little defence against the guards attack.

A game such as this would not be complete without a smattering of magic, so both the Wizard and the Ranger are endowed with mystical powers. These manifest themselves in smart-bomb fashion, destroying every guard on the screen when a certain key is pressed.

The Wizard expends a great deal of energy in casting such a spell, though the Ranger's energy value remains mysteriously unaffected.

As well as the obligatory treasure chests the dungeon is littered with magical objects and keys. Keys will open doors to new areas of the dungeon, and eating food boosts your

Price: £2.99 (cassette). Supplier: Bug-Byte, Victory House, Leicester Place, London WC2H 7NB. Tel: 01-439 0666

Goal!

★★★

TYNESOFT
GOAL!
DISC
BBC

FOOTBALL relies on several individuals working together as a team, which is one of the reasons why programmers find the game very difficult to reproduce on the computer screen.

Every football simulation I have ever played involves the player controlling one footballer and trying to score against a computerised opponent that knows exactly where you are going.

This program does nothing to break this tradition – it is no worse than the opposition but it isn't any better either.

Goal! is a five-a-side game which is played over 90 minutes. Fortunately this isn't in real time – I doubt whether there is anyone out there who could play this game for an hour and a half without suffering permanent brain damage.

The game is played on three separate screens. Kick-off occurs in the centre circle and as the ball moves to either side of the screen the display changes to show one of the two goal areas.

This three screen system is one of the game's weak points.

You may make a break with the ball and pass all four opposition players while still in the central screen. But as the screen is redrawn to show the goalmouth you will find that the blighters are waiting for you in their own goal area.

You control the player who is closest to the ball. Occasionally he will be tackled and the ball will bounce towards one of your other men.

However, this new player will not respond to the controls until you press the kick key.

You can tackle a player by getting yourself on the same horizontal plane as the man with the ball and then running at him.

If you're lucky you will emerge from this clash with the ball at your feet: Pounding away at the kick key has very little bearing on the outcome.

The computer controlled players all move together, supporting the man with the ball, while your players stand there like dummies as you race forwards. At least they reappear when you enter your opponent's goalmouth, not that they're much help.

The cassette inlay says that the computer team will adjust its level of play during the game to match your own. It never got down to my level.

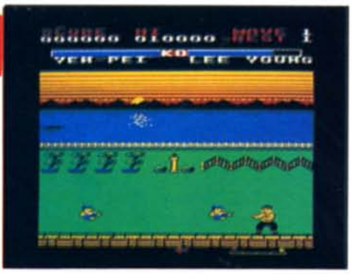
If you are desperate to play football on your computer then this game is as good as any.

Steve Brook

Price: £7.95 (cassette). Supplier: Tynesoft, Unit 3, Addison Industrial Estate, Blaydon, Tyne & Wear NE21 4TE. Tel: 091-414 4611

Yie Ar Kung Fu II

★★★★



THE popularity of martial arts games continues unabated. Yet another has appeared on the scene, this time the follow-up to the immensely successful Yie Ar Kung Fu.

For anyone who has not seen the original, you take the part of a Kung Fu fighter against a variety of opponents.

Each adversary has his – or her – own weapons and fighting style, so defeating different villains requires different tactics.

The general idea is nevertheless simple: Hit your opponent more times than he, or she, hits you.

As might be expected, Yie Ar Kung Fu II follows the same basic idea as its forerunner. This time there are three preliminary screens in which you must dodge, kick or punch lots of flying midgets, any of which will sap your strength if you don't.

Only on the fourth screen do you actually get to meet your foe. After a while, however, I found three screens of dodging' to one screen of fighting a little repetitive.

A couple of out-of-the-ordinary features are temporary invulnerability and a way of replenishing your energy. Needless to say, you earn these the hard way.

You control your man, Lee Young, using the keyboard only. Buddha be thanked, the controls are the same as for the earlier game – it would be infuriating to have to learn different sets of eight or more keys.

I'm glad to see that what I consider to be essential facilities – pause/continue, sound on/off and restart game – are all provided.

Graphically YAKF II is impressive, especially in the care taken over background detail.

Every other round brings a different backdrop, well-designed and giving its own oriental atmosphere.

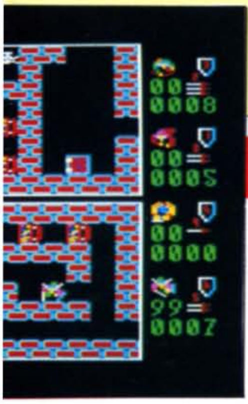
There are also a number of nifty small touches: The high-score table has a tasteful oriental border and when you defeat an opponent Lee Young will jump up and down with a happy smile on his face.

Movement is smooth – even when a sweet-looking young lady is throwing half a dozen knives at you.

On technical merits I would still rate Way of the Exploding Fist as the best karate game for the BBC. YAKF II, however, has much more variety in the actual game-play and initially is easier to play. It's certainly worthy of its honourable ancestor.

Hac-Man

Price: £8.95 (cassette), £12.95 (disc – available soon). Supplier: Imagine, 6 Central St, Manchester M2 5NS. Tel: 061-832 6633



energy rating by 10 points, up to a maximum of 99.

The magic helmet and the cross of resurrection increase the strength of your armour and the Boots of Speed will double a character's rate of travel.

Not all objects you discover are beneficial. For example, the dungeon is riddled with trap doors from which new guards appear to replace their dead comrades.

Most dangerous of all are the energy drainers, innocent looking squares which relieve you of 20 energy points when touched and are sometimes used to bar your way to a new section of dungeon.

Drainers can be destroyed by multiple blows from a weapon but great care has to be taken as they have a defence mechanism which reflects a weapon back on the attacker. A shoot-and-sidestep technique is essential if you are to survive.

When I first played the game I was under the impression that I had to collect all the treasure on a level before I could jump through the trap door to level two. This is not so: If you want to you and your three comrades can exit level one in under 30 seconds.

However, in doing so you pass up the opportunity of improving weapon and armour ratings.

Dunjunz comes complete with 25 different levels, each loaded individually from tape as required. This may sound tedious but each level takes only five seconds to load.

Loading occurs automatically when all surviving characters have jumped through the exit trap door. It is only necessary for one adventurer to survive to progress to the next level.

Once loaded, all dead characters are reincarnated with a full bill of health but with only the default values for weapons and armour. A surviving character is restored to full strength.

A save game option would have been appreciated as you are unlikely to fight your way through all 25 levels in a single session.

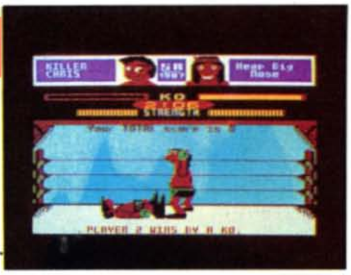
Ignoring the problem of cramming four people into an area of three square feet there is no denying that Dunjunz is a stunning piece of programming.

The action is smooth and fast and the levels tortuously difficult. This game will sell and sell.

James Riddell

The Big KO

★ ★ ★ ★



THE noble art of boxing comes to the BBC Micro courtesy of Tynesoft. Trade blows with eight mean opponents on your way to The Big KO.

On loading you are presented with a very comprehensive menu. You can have a one or two player game using either joystick or keyboard and options are also there for sound on or off, user defined keys, load or save the high score table and load a new boxer.

You have to press three keys to throw a punch – a combination of left/right, head/body and punch. Using this system, and a little skill, you can launch a flurry of different blows to penetrate your opponent's guard.

Price: £7.95 (cassette). Supplier: Tynesoft, Addison Industrial Estate, Blaydon upon Tyne, Tyne & Wear NE21 4TE. Tel: 091-414 4611

A punch which lands on target is registered with a thud and a visible response from the other fighter – either a flinch or, in the case of Sippo the clown, a nose which lights up.

Before the bout begins your four punches are listed in order of power, so too are those of your opponent. This information can be used to formulate a plan of attack – which can be surprisingly effective.

In the first bout you face Heap Big Nose, a redskin with a tendency to stick his chin out too far. Lefts and rights to the head will soon leave him with reservations.

While fighting you will see two horizontal bars above the fighters. The green one represents strength so don't let this fall to zero or you'll be powerless to defend yourself.

The blue bar is the KO meter and once this has reached 100 per cent your opponent will go down.

After much sweating, shouting and keyboard bashing, I had fought my way through to the fourth bruiser.

Handsome Devil, as he is known to his fans, is a rather robust chap with the complexion of a lobster and some suspiciously pointed ears.

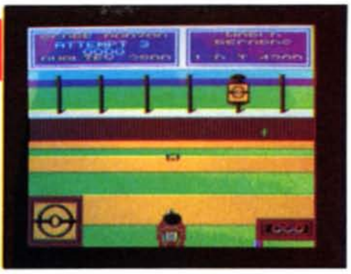
My best result so far against this beast is taking him to the third round before losing.

The Big KO is one of the best boxing games I have played on any computer. It requires, skill, concentration, cunning and – most of all – a cast iron chin.

Jon Revis

Daley Thompson's Supertest

★ ★ ★



A YEAR or two ago sports games were all the rage: Track and Field and Hyper Sports were in the arcades and on home computers programs such as Daley Thompson's Decathlon were sweeping all before them.

The follow-up to DTD, Daley Thompson's Supertest, has now been released for the BBC.

In common with other computer sports it features a series of events – in this case eight. You must pass a qualifying standard in the first to move to the next and so on. Each time you fail to qualify you lose one of your three lives.

Because of memory limitations, offering a variety of sports means loading the program in two stages. And if in either stage you can't qualify in at least one of the first three events you never see the fourth.

As its competitors – Olympic Decathlon, Hyper Sports, Micro Olympics and Commonwealth Games – have been on sale for a while, Supertest clearly needs to be something special. Unfortunately this proves not to be the case.

Price: £8.95 (cassette) £12.95 (disc). Supplier: Ocean, 6 Central St, Manchester M2 5NS. Tel: 061 832 6633

After pressing Shift+Break you are presented with a nicely drawn title page and an invitation to select day one or two. The appropriate section then loads and after you enter your initials the game begins.

My first impressions of the game were bad – poor graphics, jerky movement and minimal sound are compounded by a desperate lack of playability.

Second impressions – "my wrists hurt" – remained with me every time I played. The absence of a pause facility means that you have to play continuously, making the wrists ache still more.

You control the central figure by continuously battering two keys or waggling a joystick. Having seen this method used in the other games I find it an unnecessary waste of a good keyboard or joystick.

The grand-daddy of sports games, Summer Games on the Commodore 64, requires not brute force but precise timing. It seems a pity that more sports games have not followed this idea.

Two small points niggled: Firstly, as a diving teacher I found that the springboard diving "simulation" could hardly have been less accurate.

Secondly, surely it's common sense to put a write-protect tab on £13 worth of software?

Finely-detailed graphics, as seen in some of the competing games, combined with a more civilised method of control, would have resulted in a very enjoyable game.

Sadly, however, there will be no world records for Supertest.

Hac-Man

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Ian Whitmore gives his Master an exciting new look

A touch of the PCs

THE Viglen Master System is a unified console system for the Acorn BBC Master, allowing for a separate keyboard, and combining disc drives encased with the main board to form a monitor stand.

It arrived in a large case in which I found a very sensibly packed collection of odd-shaped bits of cream plastic, a few screws, rubber feet and connectors gathered into a poly bag, a keyboard extension cable and a pack of labels.

Tucked into one corner was an eight page illustrated instruction leaflet with details of assembly, which in general were easy to follow. The pictures were very helpful.

I carefully read the instructions and then set about the reassembly job armed with a flat file and my trusty crosshead screwdriver (you can get away with using only one, but it is easier to use both a larger and a smaller one),

About one and a quarter hours later I had my Master Console System up and running with my 5.25in drives installed. I did not need to resort to a soldering iron but some people might to deal with the 40/80 switches supplied.

The first thing is to dismantle your Master by removing the four "Fix" screws, saving them for later, and removing the top, which is not used in the final reassembly.

The keyboard is then disconnected from the main board and its retaining screws removed. Using the same screws the keyboard is mounted in the new case and the keyboard extension cable attached with the multipin links.

The next operation is the trickiest. An 18in long label for the top of the keyboard box is supplied, still attached to its backing paper. Peel off the backing paper and carefully place the label on the box. This is extremely difficult for the ham-fisted.

The label is flimsy, easily stretched, and sticks to everything in sight. I feel that Viglen might have fitted it for the customer, as it is important for the appearance of the finished machine.

On with the assembly. The keyboard box is now screwed together, trapping the cable in the notch in the lid at the same time. The keyboard is tested after attaching its cable to the main board.

If you are fitting your disc drives to the case, slide them in and attach them with their original mounting screws.

The power cable is attached to the original computer power supply and the data cable to the disc connector on the main board.

In order to achieve this the main board must be loosened, part of the slot for the disc connector filed away, and the connector attached before replacing the main board. This operation may nullify any Acorn guarantee, so beware!

It is at this point that 40/80 switches are fitted either to the back or front of the unit.

Finally you place the top onto the base and use the original four "Fix" screws to complete the assembly. The finishing touch is to place the other labels on the front, top and back of the machine.

I found the console to be a useful modification. The main unit has the same footprint as the original Master, but it now has a mobile keyboard.

The main unit can function as a monitor stand and accepts my metal cased Microvitec monitor 14in with no trouble. Access to the cartridge slots is now through the top, alongside the monitor area.

There are no sprung doors to catch on things, but the cartridge area is less accessible.

Viglen sent a Viglen Master Rom System with the review case which works well, allowing the use of two of their normal rom cartridges with each cartridge slot in the Master. This is not included in the usual console package.

Access to connectors in general is unchanged, although lifting the console system to gain access to those underneath demands a little more muscle with disc drives installed.

Viglen sell a number of accessories, such as disc data and power cables, internally mounting additional power supplies, a cooling fan kit and adaptors to enable 3.5in drives to be fitted.

Winchester hard discs can be fitted and Viglen will sell the console in any state of fitting, from the basic kit to a full blown Master system with discs, monitor and so on.

The final appearance is very professional. The only disappointment for me was the poor function keystrip holder which will not accept my Interword strip as it is too wide.

The keystrip holder is not as neat as that on the original Master, having gone back to the old B system with the strip lying flat. this requires the removal of the transparent cover to insert strips

If you want a separate keyboard in PC style then at £59 this must be a reasonable bet, especially as you also get a monitor stand and disc drive box.

Assembling the console is only difficult in two areas, the large keyboard label and having to file some of the case away for the disc data connector.

If Viglen changes the function keystrip holder the Master Console System will be almost perfect.

Product: The Viglen Master Console System
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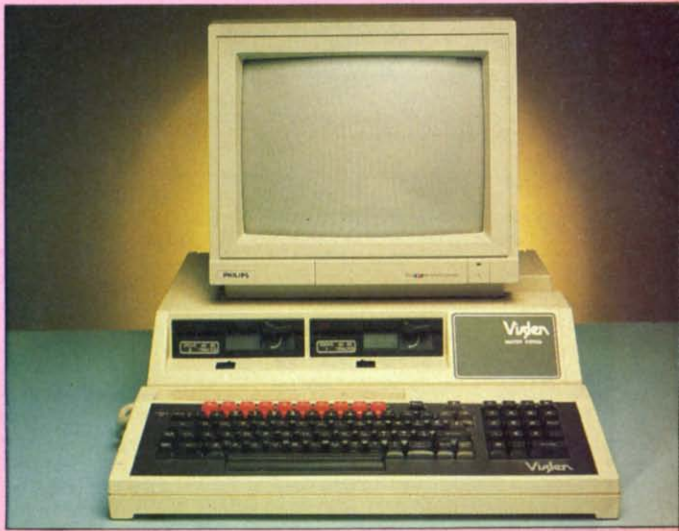
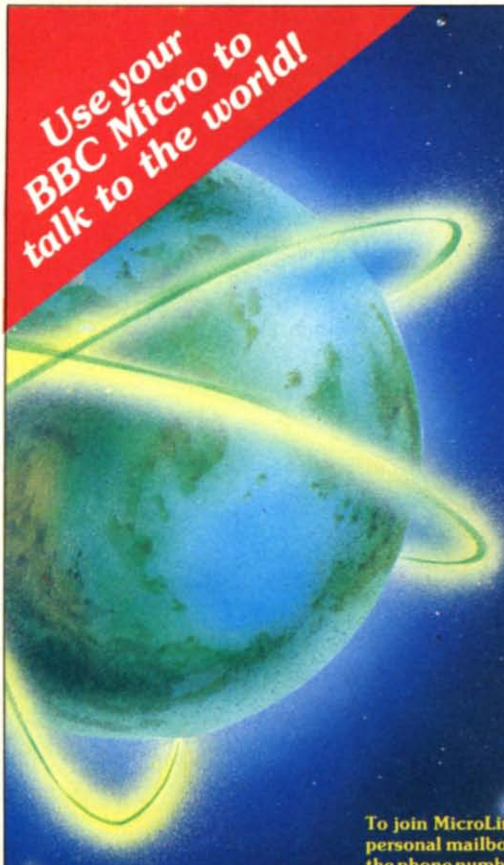


A BBC Master esconced in the Viglen console system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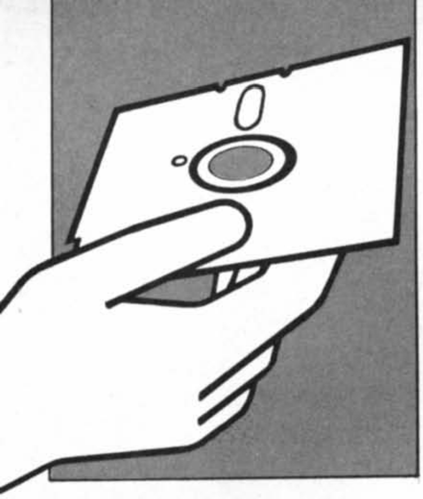


Discs from Q to A

Peter Davidson interviews Steve Evans, business development manager of Micro-stat

Q What is the difference between a single and double sided disc, and can I use a single sided one as double sided?

A *All manufacturers aim to produce double sided, double density discs and the discs are then tested to see which category they should be sold as.*

Obviously, double sided discs can be used as single sided, but often a single sided disc will work in a double sided drive.

Business users who need reliability should use high quality double sided discs, but home users will probably have no problems using single sided discs in a double sided drive.

Q What is the difference between single and double density and which should I get for for general use?

A *Again if all discs were of the highest quality possible the density would be 96tpi – sometimes known as quad density.*

During certification they are given the appropriate labels and as with the single/double sided question, using the cheaper discs (in this case 48tpi) usually works on most drives.

Q What does the term tpi that you keep using mean?

A *Tpi stands for tracks per inch and is the number of tracks that were put on and read from the disc as they were made.*

The most common sort of disc is a double sided 48 tpi disc, usually known as a double sided double density disc.

Q Is a hub ring necessary or is it just a gimmick that advertisers use to make us buy their discs?

A *They are necessary on some makes of drive but not those usually used on BBC Micros. However, if you regularly use discs with hub rings in your drive you may find that ones without will slip.*

Q Is it OK to cut a notch and new timing hole on the other side of the disc and flip it over in a single sided drive?

A *Discs designed to be flipped over are now available and there is no harm in using these or normal discs with extra notches cut in the correct places.*

There are stories that it is bad for the disc to rotate backwards in its sleeve, but this is only true of discs with cheap sleeves.

Q Is there any advantage in having a disc that is welded all the way round rather than just sealed in spots?

A *Floppy discs are often bent slightly as they are put into the drive so it could be said that the spot welded ones are better because they allow more flexibility. It all depends what point the advertiser wants to put over.*

Q Some discs are thicker than others. Do thick discs have any advantage over thin ones?

A *There is an IBM standard that determines everything about the disc, including thickness. Some companies attempt to save money by using thinner PVC for the sleeve and mass production methods lead to discrepancies.*

Q What advice would you give to someone purchasing a disc?

A *Business users need high reliability and should therefore buy discs that are certified for the use that they intend to put them to.*

Home users are more concerned about the price, and providing backups are kept, reliability is not so important.

A reasonably priced single density disc will probably work even as an 80 track double sided disc and even if the user has to reject some himself, they will work out a lot cheaper than double sided, double density ones.

The best way is to buy one of a particular make and see how well it performs for your applications.

Q Are all discs made of the same material?

A *Most discs are made by sticking ferric oxide to the cookie using a mylar base. High density discs for the IBM PC/AT and clones use cobalt and a slightly different mylar base giving them a "cobbled coating".*

Q What's a cookie?

A *It's the term we use for the actual discs. We also call them doughnuts.*

Q What does the term Clipping Level mean?

A *I liken this to dropping a ball – it will only rise part of the way back to where it was dropped.*

When a disc is made a signal is put on to it and the level of this signal is 100%. The level that can be read back is called the clipping level.

On bulk discs (used by software houses for disc duplication) this level is usually around 40%, while for a qood quality disc the figure is 50%.

Disc drives respond to levels of 20% and lower, so there is quite a large margin.

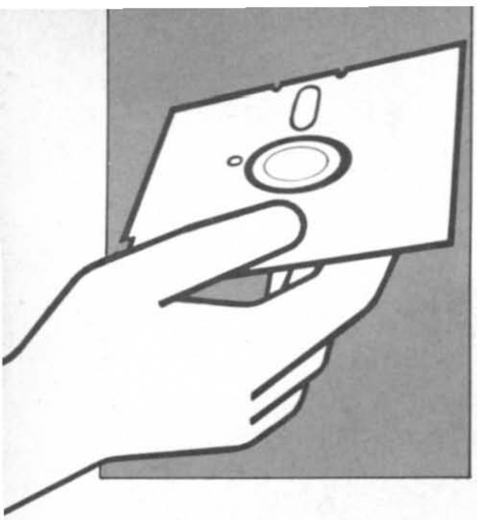
Q Occasionally I have had discs that stick in their sleeves. What causes this and how do I avoid it?

A *High pressure round the edge of a disc can crimp the cookie into the sleeve. Do not put too many discs into a box or subject them to pressure in any other form.*

Q What do you see as the future of data storage on micros?

A *The trend is away from 5.25in discs and towards 3.5in ones and to pack as much data as possible onto the smaller surface. One reputable Japanese manufacturer has developed a 3.5in disc that can hold 2Mb of formatted data.*

Further into the future, the trend will be away from magnetic media and towards optical ones with discs similar to the present compact record discs being used and allowing an even higher density of data to be written and read from small surfaces.



Anatomy of a disc drive

Mike Cook takes us on a guided tour of a disc drive's inner regions

I AM frequently asked which is the best disc drive and I always answer that they are all the same so buy the best you can. And while that advice may be a little vague, it's probably the best you'll get.

There are many disc drive manufacturers and even more companies produce "own label" units. To make matters worse the latter are often from different manufacturers at different times.

All drives perform the same task and if one works at all, it works as well as any other – such is the nature of digital electronics.

However, the many individual components can be designed in a number of different ways, so let's have a look inside a disc drive.

The function of a drive is simply to record and retrieve data. To do this the disc has to be made to spin, so the first consideration is how the drive grips the disc.

This is usually done with a wedge shaped wheel that grips the central hole when the drive door is closed.

If this grabs the disc slightly out of alignment the tracks will appear eccentric to the read head and no data will be read.

Some drives attempt to minimise this by spinning the disc automatically as the door is closed. If you suffer from this problem you can shut the door after you have typed in the disc command and so achieve the same effect.

The spinning motor can move the disc by belt or direct drive, the former being used on the earlier disc drives.

But today it is possible to make small powerful motors to drive the pulleys directly. This has the advantage of taking up less space and, normally, less current than the older method.

Somewhere on the pulley or motor there is usually a paper disc with two rings of black lines. These are strobe discs used for setting the speed of the motors.

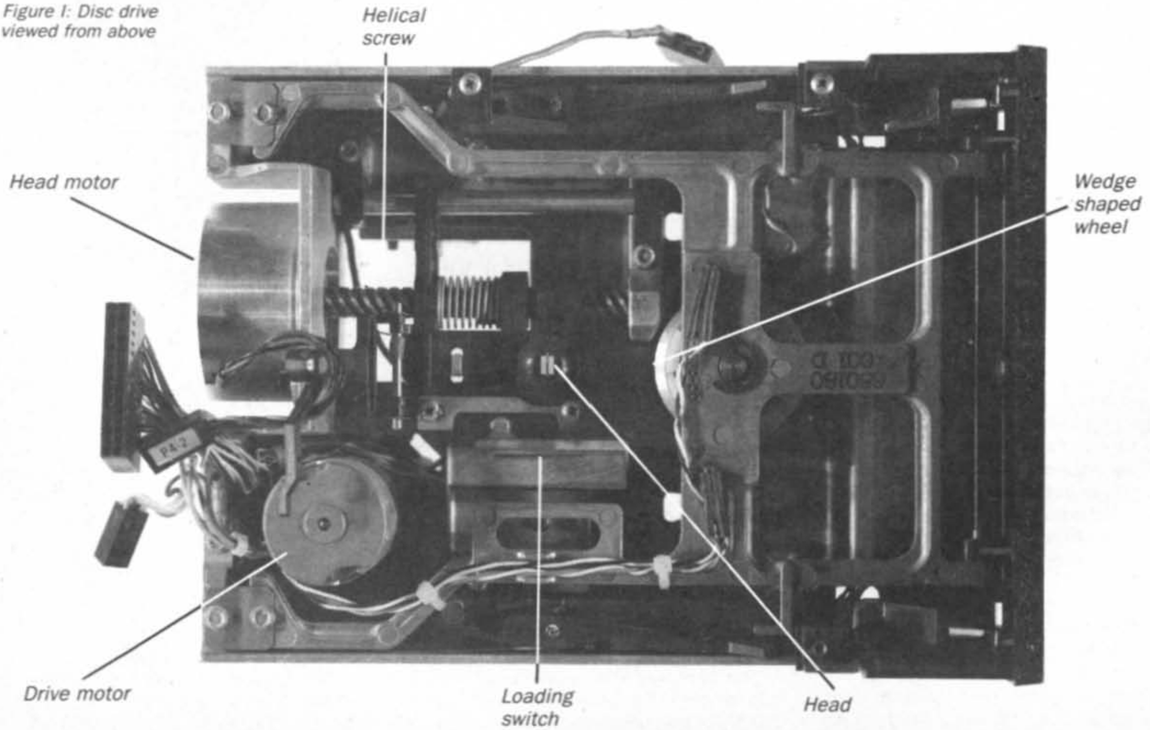
When the motor is running correctly and you view the rings under a flashing light the lines appear to stand still. One ring "stands still" when the light flashes at 50 Hz and the other at 60Hz.

These are the two frequencies used for mains transmission throughout the world and so the source of flashing light can be simply an ordinary fluorescent lamp. There is usually a potentiometer on the logic board for adjusting the speed of the motor.

Once the disc is spinning, the read/write head must be positioned on the correct track.

This is normally done with a stepping motor, but the mechanism for transferring rotary motion to head movement

Figure I: Disc drive viewed from above



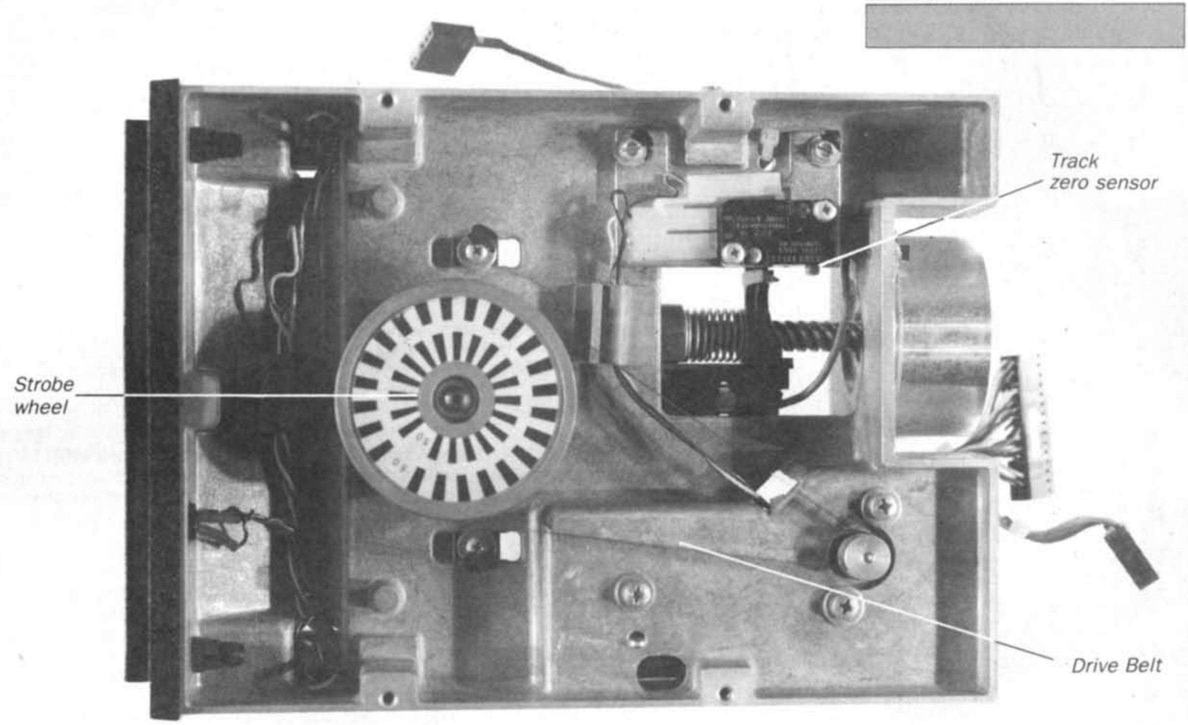


Figure II: Drive viewed from below

can differ. Traditionally this is done by having the head attached to a helical screw and as the screw turns the head moves across the disc.

Alternatively the head may be attached to a spring strip which the motor then winds and unwinds to make the head move, or it can be moved using a rack and pinion mechanism.

Whichever method is employed, the details of the design determine the rate at which the head can be moved reliably and this is known as the stepping rate. The head movement motor receives a pulse to move the head from one track to another but when it is first switched on there is no way of telling which track it is resting at.

Therefore there is some sort of detector that signals when the head is at track zero. This is normally a microswitch tripped by a small lever attached to the head. Alternatively this action may be performed by the lever breaking a light beam.

Misalignment of this switch can cause the dreaded "Can't find track zero" message.

On an early computer of mine the heads could sometimes be stepped back past the point where the track zero switch was tripped. Consequently the drive would not correctly obey the operating system.

The remedy was to dismantle the case and physically move the head or to poke into the disc controller chip a command to move the head forward several tracks. Fortunately I have not heard of this happening on the BBC Micro.

When the head is moved to the correct position it is loaded – that is it is brought into contact with the disc. This is done by an electro-magnet pulling the head towards the drive.

And there is usually a mechanical override that unloads the head whenever the drive door is opened, although some drives have the head permanently loaded to save time.

The operation of head loading can vary from drive to drive and it is known, surprisingly enough, as the head load time.

The start of each revolution of the disc is marked by a pulse given by a small hole near its centre. It is detected by a light beam and indicates the start of a track.

The pulses may also be used by diagnostic software to determine the speed of the drive instead of using the stroboscopic method.

A write protect notch on the disc indicates a disc should not be altered. This can be sensed by the drive either using a micro switch or light beam.

People with microswitch sensors often use transparent sticky tape to cover this notch but unfortunately this tends to be missed by the light beam sensors. The moral is clear – or rather the write protect covering should not be.

The protection offered by a write protect notch is normally only a software convention. However, the 8271 controller used in the first BBC Micros would not write anything if the notch was covered.

The electronics board contains all the components to make the drive function. Drives are always connected to a computer along a bus which means that all connections go to all drives.

In order to send information to only a single drive, three wires indicating the selected drive are included in the bus. And somewhere on the electronics board is a set of links or switches to select just one of these lines.

The other links can control features such as when to perform the head loading or whether to turn off the data signal when the drive is not selected.

The only real difference between makes of disc drive is the various delays that have to be introduced by the operating system during the stages of disc access.

The BBC Micro does offer a few choices of delay using the links at the bottom right hand corner of the keyboard. These are set in the factory for the maximum delay, but if you do have a fast drive they can be adjusted.

But remember that you might have to change them back when you take your computer elsewhere.

While the increased speed this gives you can look dramatic when expressed as a percentage, we are only talking about extra delays in the order of one or two seconds, so I don't consider it worth worrying about.

Operating a drive at a speed close to its limit can reduce the reliablity of operation so it is best to leave the links alone, they can be more trouble than they are worth.

So there you have it – the disc drive dissected. Have a peek inside yours and see if you can identify its major components. ■

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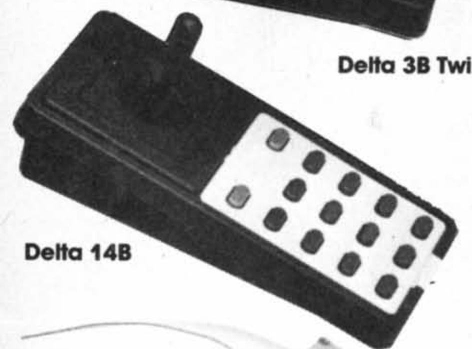

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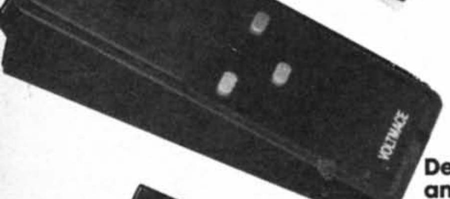

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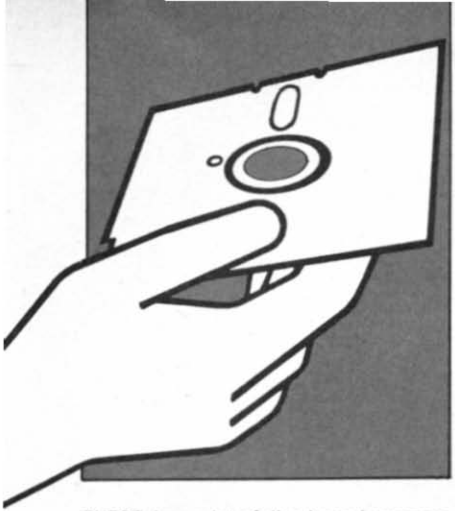

DIY dual format discs

Chris Nixon shows how it's done without a special program

THESE days a lot of disc-based commercial software for the BBC Micro is sold on dual format discs. These are discs that have been formatted in a special way which allows them to be used in either a 40 or an 80 track disc drive.

This is a clever technique which relies on the fact that the catalogue information for both types of disc is in track 0 and this is in the same position for both types of drive.

If you have an 80 track disc drive switchable to 40 track, or one of each type of drive (there is always a catch), you can create your own dual format discs. You will also need any 40 track formatter.

From now on you will be able to distribute your programs or data files knowing that they will function correctly no matter which type of drive they will eventually be used with.

Firstly a word about formatting in general. As you probably know, any disc is unusable until it has undergone a process known as formatting.

A formatter is usually a machine code program which places magnetic markers on the disc showing where each track and sector start.

A track is a thin circular band of magnetic data on the disc on which program data is stored. According to which type of disc drive you have, there will be either 40 or 80 of them packed very closely together, making a band about 1.5 inches wide on the disc.

Each track is divided into 10 sectors of 256 bytes each. And every sector on the disc has an ID field.

This consists of a few extra bytes that contain information about which track the sector is part of, and what position (out of 10) in that track the sector occupies.

In this way, the disc drive head can position itself quickly and accurately over the correct part of the disc ready to store or retrieve data. Without these tracks, the disc drive head would not be able to find any position on the disc at all and would report an error.

During formatting the newly created sectors are filled with 256 values of &E5 (hex) to signify that they are blank.

After the whole disc has been formatted in this way, the first two sectors on it which are used to store the disc catalogue are filled with zeros, apart from a few bytes on sector 1 which tell the computer how many sectors are present on the disc.

This will be either 400 for a 40 track disc (10 sectors x 40 tracks) or 800 for an 80 track disc (10 sectors x 80 tracks).

Knowing all this, you are ready to prepare your disc in the 40/80 format. The steps to follow, using a 40 track formatter in all cases, are:

- Format the disc in a 40 track or 80 track double-stepping drive – as shown in Figure I.
- Format the disc in an 80 track drive – see Figure II.
- Still using an 80 track drive, save a dummy file to fill the part of track 0 not used for the catalogue and tracks 1 to 19 using:

```
*SAVE DUMMY 1900 +C600
```

- Finally press Control+Break to clear the machine and you are ready to put some programs on your new dual format discs – see Figure III.

Now comes the tedious part. Any file you wish to place on the disc must be recorded in both 80 and 40 track modes. The exception is the !BOOT file if it is less than 2k in length. This is not diffi-

Turn to Page 44 ▶

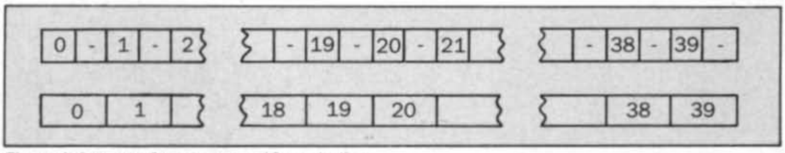

Figure I: Layout of tracks on a 40 track disc

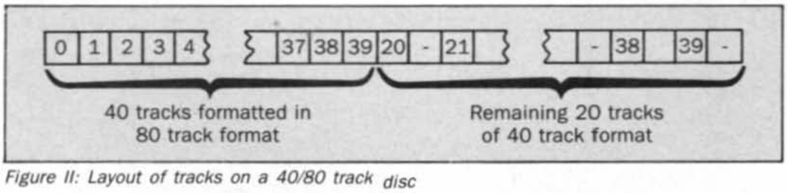

Figure II: Layout of tracks on a 40/80 track disc

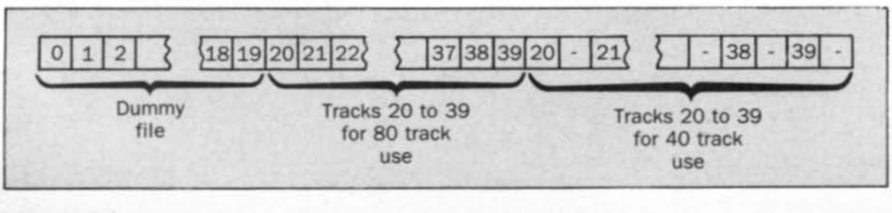

Figure III: Usage of a 40/80 track disc

◄ From Page 43

cult to do, but it can be easy at this point to make disastrous mistakes which will require you to reformat and start all over again.

The method I use to avoid confusion is to first switch the drive to 40 track and copy over all files, before switching to 80 track and copying them all again.

I will explain the reason for this shortly, but if you are one to shy from technical details, you need go no further. Your disc is ready for use and you should now test it in both 40 and 80 track modes.

How it works

If some or all programs don't load, you have made a mistake in the copying process and I'm afraid you will have to reformat the disc.

The reason for recording each file in both 40 and 80 tracks is the new layout of the disc. The only way to dual format a disc is basically to format half of it as an 80 track disc and half as a 40 track disc.

In our case, the first 40 tracks are formatted correctly as for an 80 track disc and the remaining 40 tracks are formatted to look like tracks 20 to 40 of a 40 track disc, with spaces between them. A dummy file which takes up the first 20 tracks is then saved in the catalogue.

The way this strange arrangement works is that when a file is saved on the disc the catalogue is accessed and found in either format. The presence of the 20 track long dummy file then forces the operating system to save the file at the start of the 21st track.

Now remember, with our special format tracks 20 to 39 do not overlap at all and exist in both the 80 and 40 track sections. The result is that the file now exists in two separate areas of the disc, while the operating system thinks that it has erased over the first copy.

Unfortunately, as you have probably worked out, we end up with only 20 tracks of the disc which are usable for our data. This is because the catalogue together with the dummy file – which must be present – takes 50k. However, this still leaves 50k of program storage, quite adequate for marketing most programs and packages.

Be careful not to use discs formatted using this method for distributing data storage programs such as databases, mailing lists and drawing packages.

It is impossible to control the users drive from software to switch from 40 to 80 tracks for the necessary double-saving of data, and anyway 50k of disc space is not really sufficient for such uses.

Making more room

Finally, instead of wasting all track 0, as a last operation any program that is under 2k in length can be saved as DUMMY and then renamed to the filename of your choice.

Doing this lets the disc system think that tracks 1 to 19 are free to use, so you must not try to save any more programs on the disc.

And that's all there is to creating a dual format disc without any special programs to achieve it. ■

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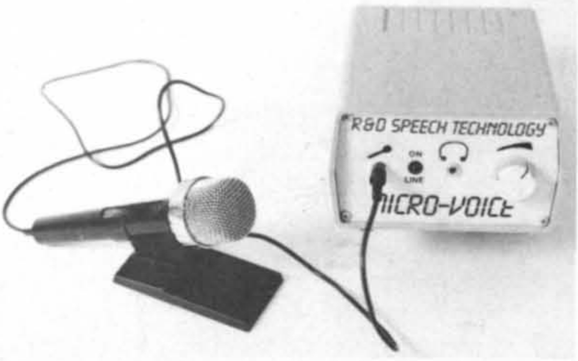

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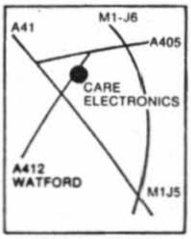

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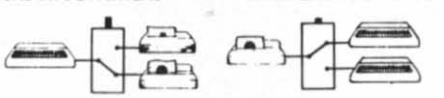

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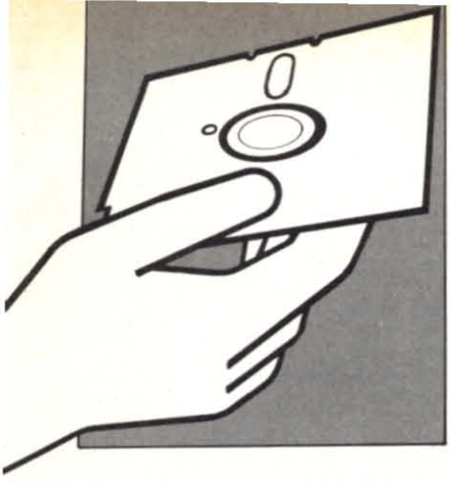

The lock that baffles pirates

Chris Nixon shows how to beat off those software pirates

HAVE you ever wondered how the best software houses protect their discs from the prying eyes of software pirates?

With the Disclok protection system you can now enjoy the same security as the big names, with the freedom to distribute your software on disc in complete safety.

The secret of good protection is to do the unexpected.

For instance, you may have come across the technique of using a disc editor program to poke naughty bytes into the disc catalogue, to fool users into believing there are less files on the disc than there actually are.

This works fine until someone else with a disc editor examines your disc and sees what you have done. To ensure total security, or at least a huge headache for the hacker, a more obscure approach is necessary.

In this article I am not going to explain how the Disclok system works, in case there are any would-be pirates reading it, but it does work well.

To use the system type in Listing I and save it as LOK.SRC. Now run it and the assembled machine code will be saved on the disc as DISCLOK. This is the part of the system that actually protects the disc.

Now type in Listing II and save it as KEY.SRC. Run it and the assembled machine code will be saved as L. This is the key that enables programs protected with Disclok to be run.

Any Basic or machine code programs may be protected as the key automatically detects which is which.

Now you are ready to protect some discs. For this I suggest that you format some new ones, as you can lose vital programs if you make any serious errors.

Disclok only allows seven files out of the full 31 to be protected and these must be in the P directory. So copy all the programs that make up your package on to a freshly formatted disc and put each one into the P directory using the *RENAME command.

This is to ensure that Disclok only protects those files that you want it to.

The next step may take some time, but it is necessary. Every program in your package that calls a protected program must have the CHAIN and *RUN commands replaced in the following way.

To run a protected file the filename is put into page &900, terminating with a Return code (&0D). Then just execute *RUN L.

For example, if you wanted the !boot file to run a protected file called GAME, you would construct the !boot file like this:

```
*BUILD !boot
0001 *BASIC
0002 $&900="GAME"
0003 *RUN L
```

Or from the end of a Basic program:

```
32000 $&900="GAME"
32010 *RUN L
```

Note that you do not include the P directory prefix with the filename as Disclok automatically removes all protected files from the P directory.

One area of difficulty is if you are trying to CHAIN one Basic program from the middle of another.

The Disclok system uses a homemade version of CHAIN which does not reset Basic properly. The solution is simple although long-winded. Replace the method above with:

```
32000 !&70=P%:P%=&A00:[LDA #138:LDX #0:L
DY &50:JMP &FFF4]:P%=!&70:CC$="*B."+CHR$
13+"PA.=&####:$&900=""zzzz"":*RUN L"+CHR
$13:FOR LL%=1 TO LENCC$:?&50=ASCMID$(CC$
,LL%):CALL&A00:NEXT:END
```

where #### is the value of page required to run the program and zzzz is the name of the program to be run.

Finally copy the program L on to the disc. We now have a fully prepared disc, ready for protecting. Make a copy of it as a prepared master disc – because you won't be able to copy the protected disc.

All that remains is the actual protection. Insert the disc containing Disclok in drive 0 and type *DISCLOK. You will then be instructed to remove the disc and insert the disc to be protected.

Disclok will quickly scan the directory protecting any program on the P directory, and protect the disc so that it cannot be backed up. If no file is found then the error message No P directory files found is generated.

If all has gone well, the computer will beep and announce "Disc now locked". If you don't believe it, try it.

You will find that the protected files are no longer on the P directory, and look pretty normal. That is, until you try to LOAD, *LOAD, CHAIN, *RUN, *DUMP, *TYPE, *COPY, *BACKUP or *INFO them.

● *Please don't send any protected discs to* The Micro User, *because we don't know how to crack them either.*

Listing I

```
 10 REM ************************
 20 REM * DISC-LOK Version 1 *
 30 REM *   by Chris Nixon   *
 40 REM *    January 1987    *
 50 REM * (c) The Micro User *
 60 REM ************************
 70 REM
 80 MODE7:DIM CODE% 2000
 90 mess=&70:cat=&900:cat1=&B00
100 FORPASS=4TO6 STEP2
110 P%=&1300:O%=CODE%
120 [OPT PASS
130 JSR setup:JSR loadcat
140 JSR copycat:LDA progcount
150 BEQ noprogs:JSR password
160 JSR savecopy:LDA #mess1 MOD 256
170 STA mess:LDA #mess1 DIV 256
180 STA mess+1:JMP message
190 .noprogs
200 LDA #mess2 MOD 256:STA mess
210 LDA #mess2 DIV 256:STA mess+1
220 JSR message:JMP &FFE7
230 .setup
240 LDA #21:LDX #0:LDY #0:JSR &FFF4
250 LDA #title MOD 256:STA mess
260 LDA #title DIV 256:STA mess+1
270 JSR message:LDA #0:STA drive
280 JSR &FFE0:BCS escape:RTS
290 .escape
300 LDA #126:JMP &FFF4
310 .loadcat
320 LDA #cat MOD 256:STA block+1
330 LDA #cat DIV 256:STA block+2
```

Turn to Page 48 ▶

◀ *From Page 47*

```
340 LDA #&53:STA block+6:LDA #0
350 STA param:STA param+1:LDA #&22
360 STA param+2:JMP osword7F
370 .copycat
380 LDA cat+&105:LSR A:LSR A:LSR A
390 STA maxprog:DEC maxprog:LDA #8
400 STA catptr:LDA #0:STA catptr1
410 STA progcount
420 .progloop
430 LDX catptr:LDA cat+7,X:AND #&7F
440 CMP #ASC"P":BNE nextprog
450 JSR copyinfo
460 .nextprog
470 LDA progcount
480 CMP maxprog1:BEQ exitcopycat
490 CLC:LDA catptr:ADC #8:STA catptr
500 DEC maxprog:BPL progloop
510 .exitcopycat
520 RTS
530 .copyinfo
540 LDX catptr:LDY catptr1:LDA #7
550 STA counter
560 .copyentry
570 LDA cat,X:STA cat1,Y
580 LDA cat+&100,X:STA cat1+8,Y
590 LDA #&FF:STA cat+&100,X:INX:INY
600 DEC counter:BPL copyentry
610 LDX catptr:LDA #ASC"$":STA cat+7,X
620 TXA:LDX catptr1:STA cat1+7,X
630 INC progcount:CLC:TXA:ADC #16
640 STA catptr1:RTS
650 .savecopy
660 LDA #cat MOD 256:STA block+1
670 LDA #cat DIV 256:STA block+2
680 LDA #&4B:STA block+6:LDA #0
690 STA param:STA param+1:LDA #&22
700 STA param+2:JSR osword7F
710 LDA #&7F:LDX #format MOD 256
720 LDY #format DIV 256:JSR &FFF1
730 LDA #cat1 MOD 256:STA block+1
740 LDA #cat1 DIV 256:STA block+2
750 LDA #&4F:STA block+6:LDA #&27
760 STA param:LDA #&69:STA param+1
770 LDA #1:STA param+2
780 .osword7F
790 LDA drive:STA block
800 LDX #block MOD 256
810 LDY #block DIV 256
820 LDA #&7F:JMP &FFF1
830 .message
840 LDY #0
850 .messloop
860 LDA (mess),Y:CMP #42:BEQ exitmess
870 JSR &FFE3:INY:JMP messloop
880 .exitmess
890 RTS
900 .password
910 LDX #&79:LDA progcount:STA cat1,X
920 DEX:LDY #8
930 .saveprog
940 LDA prog,Y:STA cat1,X
950 DEX:DEY:BPL saveprog:RTS
960 .catptr:BRK
970 .catptr1:BRK
980 .progcount:BRK
990 .maxprog:BRK
1000 .maxprog1:OPT FNequb(7)
1010 .counter:BRK
1020 .drive:BRK
1030 .format
1040 BRK:OPT FNequd(idfields)
1050 OPT FNequb(5):OPT FNequb(&63)
1060 OPT FNequb(39):OPT FNequb(11)
1070 OPT FNequb(18):BRK:OPT FNequw(16)
1080 .block:BRK:BRK:BRK:BRK:BRK
1090 OPT FNequw(3)
1100 .param:OPT FNequd(0):OPT FNequd(0)
1110 .prog:LDA #200:LDX #2:LDY #0
1120 JMP &FFF4
1130 .title
1140 OPT FNequb(22):OPT FNequb(7)
1150 OPT FNequb(31):OPT FNequb(7)
1160 OPT FNequb(0):OPT FNequb(141)
```

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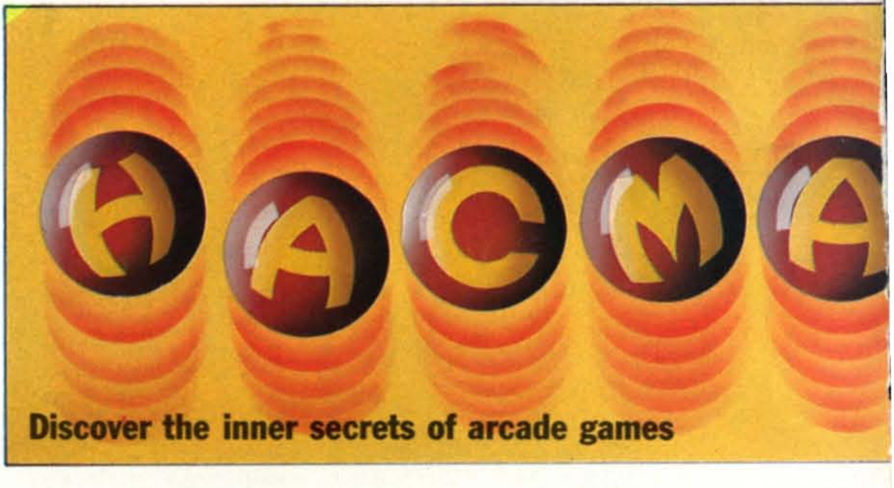
```
 1170 OPT FNequb(129):OPT FNequb(157)
 1180 OPT FNequb(131)
 1190 OPT FNequs("DISC-LOK Version 1  ")
 1200 OPT FNequb(156):OPT FNequb(31)
 1210 OPT FNequb(7):OPT FNequb(1)
 1220 OPT FNequb(141):OPT FNequb(129)
 1230 OPT FNequb(157):OPT FNequb(131)
 1240 OPT FNequs("DISC-LOK Version 1  ")
 1250 OPT FNequb(156)
 1260 OPT FNequb(31):OPT FNequb(10)
 1270 OPT FNequb(3):OPT FNequb(134)
 1280 OPT FNequs("(c) The Micro User")
 1290 OPT FNequb(13):OPT FNequb(129)
 1300 OPT FNequs(STRING$(38,"-"))
 1310 OPT FNequb(28):OPT FNequb(0)
 1320 OPT FNequb(24):OPT FNequb(39)
 1330 OPT FNequb(5):OPT FNequb(12)
 1340 OPT FNequb(13)
 1350 OPT FNequs(" 1) Remove this disc f
rom the drive")
 1360 OPT FNequw(&0D0D)
 1370 OPT FNequs(" 2) Insert disc to pro
tect in drive 0")
 1380 OPT FNequw(&0D0D)
 1390 OPT FNequs(" 3) Press a key...*")
 1400 .mess1
 1410 OPT FNequb(12):OPT FNequb(7)
 1420 OPT FNequb(13)
 1430 OPT FNequs(" Disc now locked.")
 1440 OPT FNequw(&0D0D):OPT FNequb(42)
 1450 .mess2
 1460 OPT FNequb(12):OPT FNequb(7)
 1470 OPT FNequb(13)
 1480 OPT FNequs(" No "P" directory fi
les on disc.")
 1490 OPT FNequw(&0D0D):OPT FNequb(42)
 1500 .idfields
 1510 OPT FNequd(&00FFBC27)
 1520 OPT FNequd(&00FFBC27)
 1530 OPT FNequd(&00FFBC27)
 1540 OPT FNequd(&00FFBC27)
 1550 OPT FNequd(&00FFBC27)
 1560 OPT FNequd(&00FFBC27)
 1570 OPT FNequd(&00FFBC27)
 1580 OPT FNequd(&00FFBC27)
 1590 OPT FNequd(&00FFBC27)
 1600 OPT FNequd(&00FFBC27)
 1610 OPT FNequd(&00FFBC27)
 1620 OPT FNequd(&00FFBC27)
 1630 OPT FNequd(&00FFBC27)
 1640 OPT FNequd(&00FFBC27)
 1650 OPT FNequd(&00FFBC27)
 1660 OPT FNequd(&00FFBC27)
 1670 OPT FNequd(&00FFBC27)
 1680 OPT FNequd(&0069BC27)
 1690 ]:NEXT
 1700 $&900="SAVE DISCLOK "+STR$~CODE%+"
 "+STR$~O%+" 1300 1300"
 1710 X%=0:Y%=9:CALL&FFF7:END
 1720 DEF FNequb(N%)
 1730 ?O%=N%:O%=O%+1:P%=P%+1
 1740 =PASS
 1750 DEF FNequw(N%)
 1760 ?O%=N% MOD 256
 1770 ?(O%+1)=N% DIV 256
 1780 O%=O%+2:P%=P%+2
 1790 =PASS
 1800 DEF FNequd(N%)
 1810 !O%=N%:O%=O%+4:P%=P%+4
 1820 =PASS
 1830 DEF FNequs(N$)
 1840 FORL%=1 TO LENN$
 1850 O%?(L%-1)=ASC(MID$(N$,L%,1))
 1860 NEXT:O%=O%+LENN$:P%=P%+LENN$
 1870 =PASS
```

Listing II

```
   10 REM ***********************
   20 REM * DISC-KEY Version 1 *
   30 REM *   by Chris Nixon   *
   40 REM *    January 1987    *
   50 REM * (c) The Micro User *
   60 REM ***********************
   70 REM
   80 MODE7:DIM CODE% 2000
   90 mess=&70:maxprog=&C79
  100 FORPASS=0TO2 STEP2
  110 P%=&A00
  120 [OPT PASS
  130 JSR checkdisc
  140 JSR checkname:JSR getinfo
  150 JMP loadprog
  160 .checkdisc
  170 LDA #&7F:LDX #block1 MOD 256
  180 LDY #block1 DIV 256:JSR &FFF1
  190 LDX #&78:LDY #8
  200 .checkloop
  210 LDA prog,Y:CMP &C00,X
  220 BNE wrongdisc:DEX:DEY
  230 BPL checkloop:JMP &C70
  240 .wrongdisc
  250 JMP (&FFFC)
  260 .prog
  270 LDA #200:LDX #2:LDY #0:JMP &FFF4
  280 .checkname
  290 LDA &900:CMP #&0D:BEQ notfound
  300 LDA #0:STA progcount:STA catptr
  310 .nameloop
  320 LDX #0:LDY catptr
  330 .charloop
  340 LDA &900,X:CMP #&0D:BEQ found
  350 CMP &C00,Y:BNE nextname
  360 INX:INY:CPX #7:BNE charloop
  370 .found
  380 LDA catptr:RTS
  390 .nextname
  400 CLC:LDA catptr:ADC #16:STA catptr
  410 INC progcount:LDA progcount
  420 CMP maxprog:BCC nameloop
  430 .notfound
  440 BRK:BRK:EQUS"Not found":BRK
  450 .readsector
  460 LDA &CD:STA block:STX param
  470 STY param+1:LDA #&21:STA param+2
  480 LDA #3:STA block+5
  490 LDA #&53:STA block+6
  500 LDX #block MOD 256
  510 LDY #block DIV 256
  520 LDA #&7F:JMP &FFF1
  530 .getinfo
  540 PHA:TAX:LDA &C0E,X:AND #3
  550 STA DVID+1:LDA &C0F,X:STA DVID
  560 JSR gettrack:PLA:TAX:LDA &C0D,X
  570 STA proglength:LDA &C0A,X:STA exec
  580 LDA &C0B,X:STA exec+1:BMI basic
  590 LDA &C08,X:STA load:LDA &C09,X
  600 STA load+1:LDA #0:STA basicflag
  610 RTS:.basic
  620 LDA #0:STA load:LDA &18:STA load+1
  630 LDA #1:STA basicflag:RTS
  640 .loadprog
  650 LDA load:STA block+1
  660 LDA load+1:STA block+2
  670 .loadloop
  680 LDX track:LDY sector
  690 JSR readsector:INC sector
  700 LDA sector:CMP #10:BEQ nexttrack
  710 .reenter
  720 INC block+2:DEC proglength
  730 BPL loadloop:LDA basicflag
  740 BNE doRUN:JMP (exec)
  750 .doRUN
  760 LDY #ASC"O":JSR insert
  770 LDY #ASC".":JSR insert
  780 LDY #13:JSR insert
  790 LDY #ASC"R":JSR insert
  800 LDY #ASC"U":JSR insert
  810 LDY #ASC"N":JSR insert
  820 LDY #13
  830 .insert
  840 LDA #138:LDX #0:JMP &FFF4
  850 .nexttrack
  860 INC track:LDA #0:STA sector
  870 JMP reenter
  880 .gettrack
  890 LDA #10:STA DVIS:LDA #0:STA DVIS+1
  900 JSR divide:STA sector:LDA DVID
  910 STA track:RTS
  920 .divide
  930 LDA #0:STA QUOT:LDX #16
  940 .LOOP
  950 ASL DVID:ROL DVID+1:ROL A:TAY
  960 ROL QUOT:CMP DVIS:LDA QUOT
  970 SBC DVIS+1:BCC LESS:TYA:SBC DVIS
  980 TAY:LDA QUOT:SBC DVIS+1:STA QUOT
  990 INC DVID
 1000 .LESS
 1010 TYA:DEX:BNE LOOP:RTS
 1020 .DVIS:BRK:BRK
 1030 .DVID:BRK:BRK
 1040 .QUOT:BRK:BRK
 1050 .xpos:BRK
 1060 .track:BRK
 1070 .sector:BRK
 1080 .temp:BRK
 1090 .catptr:BRK
 1100 .proglength:BRK
 1110 .load:BRK:BRK
 1120 .exec:BRK:BRK
 1130 .basicflag:BRK
 1140 .code:OPT FNequb(30)
 1150 .progcount:BRK
 1160 .key:OPT FNequb(&69)
 1170 .block1
 1180 BRK:OPT FNequd(&C00)
 1190 OPT FNequb(3):OPT FNequb(&57)
 1200 OPT FNequw(&6927):OPT FNequb(&21)
 1210 .block:BRK:BRK:BRK:OPT FNequd(0)
 1220 .param
 1230 OPT FNequd(0):OPT FNequd(0)
 1240 ]:NEXT
 1250 $&900="SAVE L A00 "+STR$~P%
 1260 X%=0:Y%=9:CALL&FFF7:END
 1270 DEF FNequb(N%)
 1280 ?P%=N%:P%=P%+1
 1290 =PASS
 1300 DEF FNequw(N%)
 1310 ?P%=N% MOD 256
 1320 ?(P%+1)=N% DIV 256
 1330 P%=P%+2
 1340 =PASS
 1350 DEF FNequd(N%)
 1360 !P%=N%:P%=P%+4
 1370 =PASS
```

This listing is included in this month's cassette tape offer. See order form on Page 159.

Part 2



Discover the inner secrets of arcade games

AS PROMISED, this month I am going to concentrate on what is, judging by the number of letters I have received, by far the most popular game around at the moment: Repton 3.

The Repton games are without doubt some of the most remarkable ever seen on the BBC Micro, and Repton 3 takes the game strategy to new heights.

It combines the best features of both the original and Repton 2 while adding many other novel features, such as capsules to reset the countdown timer, and a nasty creeping fungus. Ugh.

The idea of Repton 3 is similar to its predecessors in that you collect all the diamonds from each level, while avoiding falling boulders, monsters which hatch from broken eggs and many other nasties.

If you perform this task successfully you are given a password for the next level, a feature retained from the first Repton. You are also given an edit code, which will be explained shortly.

Repton 3 is by far the largest of the three games. It has no less than 24 huge screens, loaded in turn in blocks of eight, called respectively Prelude, Toccata and Finale.

Included with the game is a screen designer that allows you to redesign all the screens and characters, or even design your own from scratch. A sort of do-it-yourself masochism.

One feature is that you can edit one of the predefined screens only after entering the appropriate edit code. Therefore, in order to be able to modify a screen you first have to be able to do it. This is, of course, only fair.

The designer also allows you to define your own passwords so that anyone attempting your screens must tackle them stage by stage, as in the original.

What it does not do is allow you to add codes to your own masterpieces to prevent them from being edited.

Messrs P. Lander and C. Norton have sent in a routine which adds random codes to screens (Listing I) which is compatible with both tape and disc versions – many thanks to both of you.

Many of you have already finished the game and sent in the complete list of passwords and edit codes.

Thanks to John Gill, Michael Horsfield,

Vine Micros

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VISA

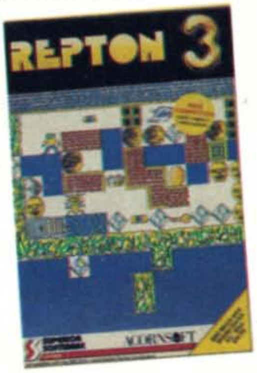
Jason Hartley and the persistent C. Parsons to name but a few, not forgetting Mark Wickett and Matthew Corbett for their excellent 16 page detailed guide to the game.

The passwords and edit codes, which are also compatible with the Electron version of the game, are as follows:

	Prelude	Toccata	Finale
A	Prelude 56882	Toccata 48042	Finale 27246
B	Citadel 44544	Upstart 6527	Enliven 24937
C	Morning 13330	Octagon 27492	Contest 3200
D	Awkward 33023	Chaotic 20312	Illegal 19786
E	Fritter 24656	Majesty 1356	Appease 3346
F	Lawless 8515	Revenue 16713	Student 20055
G	Ration 3447	Foresee 50190	Average 16660
H	Tobacco 2303	Reserve 65280	Phoenix 51762

Unfortunately the screens of the BBC Micro and Electron versions are not compatible: One cannot be loaded into the other's editor.

Repton 3 offers a competition. When the eighth and last screen of each of the three blocks has been completed an entry code is given – to enter the competition you must supply all three.



What makes the game more difficult is that an entry code will be displayed only if all the screens have been completed without passwords. All eight in one go, three times over.

The Repton 3 screen editor allows almost infinite expansion of the game and *The Micro User* would like to release a compilation of screens produced with the Repton 3 editor, but for this we need your help.

If you have designed a complete set of eight screens, preferably with redefined characters, that you're itching to unleash on others then send them in to me, care of *The Micro User*.

```
  100 REM R3 Screen Edit Code Generator
  110 REM by P.Lander & C.Norton
  120 REM (c) The Micro User
  130 DIM file% 2620
  140 INPUT"Load name",name$
  150 PROCoscli("LOAD "+name$+" "+FNhex(
file%))
  160 FOR I%=&50 TO &5F
  170 I%?file%=RND(255):NEXT
  180 INPUT"Save name",name$
  190 PROCoscli("SAVE "+name$+" "+FNhex(
file%)+"+2620 0000")
  200 END
  210 DEF PROCoscli($&700)
  220 LOCAL X%,Y%:Y%=7
  230 CALL &FFF7:ENDPROC
  240 DEF FNhex(D%)=FNh(D%DIV&100)+FNh(D
%AND&FF)
  250 DEF FNh(H%)=STR$~(H%DIV&10)+STR$~(
H%AND&F)
```

Listing I: Repton 3 Screen Random Edit Code Generator

Who can design the most original characters? Repton himself is bound to rear his ugly head quite often, but how about something completely different?

What about a spaceman, robot or werewolf in place of Repton? Who can design the most fiendishly difficult screens? And what about a jungle, spaceship or plan view of city streets instead of the present underground scenes?

One point I must emphasise: No matter how pretty your characters and how complex your screens, if they are impossible to complete we cannot use them.

Before you send them to us make sure that you can actually finish all eight of them, and include the best route for solving each screen.

Lastly, if you add passwords or edit codes, don't forget to send a list of the codes together with the screens. Who knows – your masterpieces may soon be wreaking mayhem all over the country.

To change the subject at last, one game suddenly surging in popularity is Elite's Commando.

Thank you, Matthew Bain, for your many tips; but Ian Webb's long list of pokes for the cassette version – covering virtually every possible aspect of the game – really steals the show.

Type *LOAD TGAME (Return) and wait until that file has loaded. Then make any of the modifications below:

Type CALL &2300 (Return) to start the game. Thank you, Ian.

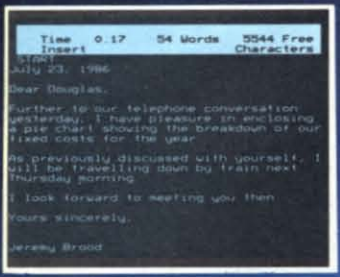
As I write, neither of Commando's much-heralded competitors, Who Dares Wins II and Green Beret, have yet been released; if you are after a "one-man-against-the-odds" game, Commando's worth a look. And it's Master compatible.

?&2355	Speed of game (0 is full speed).
?&23B8=0	Infinite lives.
?&24DC	Number of bonus lives gained every 10000 points.
?&2539	Start level number, 0 to 3.
?&254D	Initial number of lives.
?&2553	Number of grenades.
?&2D55=0	Walk over trenches.
?&2D85	Number of grenades in a box.
?&2EB5=1	Repeating fire.
?&31F0=&D0	Soldiers die instantly.
?&3211=&FE	Soldiers disappear when killed.
?&34E6=&A9:?&34E7=1	Soldiers do not shoot.
?&369E=0	Impervious to cars, trucks or motorbikes.
?&3829	Number of hits required to destroy a car or motorbike (with 0 it explodes instantly).
?&3867	Number of hits required to destroy a truck, 5 or less causes it to explode instantly.
?&3C13=0	Infinite grenades.
?&3CDC=0:?&3CDF=&F0	Impervious to grenades.
?&4011=0:?&4014=&F0	Impervious to bullets.

Pokes for the cassette version of Commando

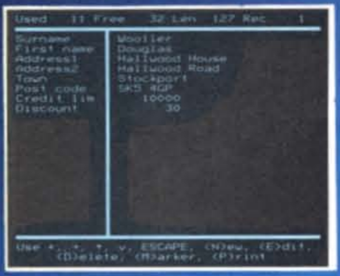
● *Next month, among other goodies, how to run the enhanced Master version of Stryker's Run on a Model B equipped with sideways ram. Until then, happy blasting.*

All this in just



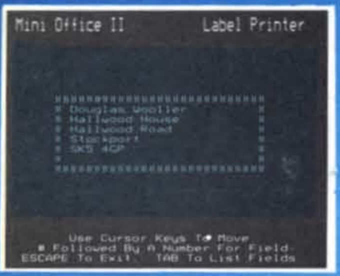
```
  Time   0.17    54 Words   5544 Free
  Insert                    Characters
 START
July 23, 1986

Dear Douglas,

Further to our telephone conversation
yesterday, I have pleasure in enclosing
a pie chart showing the breakdown of our
fixed costs for the year

As previously discussed with yourself, I
will be travelling down by train next
Thursday morning

I look forward to meeting you then

Yours sincerely,


Jeremy Brood
```

WORD PROCESSOR
Compose a letter, set the print-out options using embedded commands or menus, use the mail merge facility to produce personalised circulars – and more!



```
Used   11 Free   32 Len  127 Rec     1
Surname        Wooller
First name     Douglas
Address1       Hallwood House
Address2       Hallwood Road
Town           Stockport
Post code      SK5 4GP
Credit lim        10000
Discount             30

Use ←, →, ↑, ↓, ESCAPE, (N)ew, (E)dit,
      (D)elete, (M)arker, (P)rint
```

DATABASE
Build up a versatile card index, use the flexible print out routine, do powerful multi-field sorting, perform all arithmetic functions, link with the word processor – and more!



```
Mini Office II             Label Printer



     ##############################
     # Douglas Wooller            #
     # Hallwood House             #
     # Hallwood Road              #
     # Stockport                  #
     # SK5 4GP                    #
     #                            #
     ##############################



        Use Cursor Keys To Move
   # Followed By A Number For Field
ESCAPE To Exit    TAB To List Fields
```

LABEL PRINTER
Design the layout of a label with the easy-to-use editor, select label size and sheet format, read in database files, print out in any quantity – and more!

70
60
50
40
30
20
10
0
J F M A M J J A
PRODUCTION COSTS
cub
DATABASE SOFTWARE
Mini
Office
Mini Office II
Main menu
Word Processor
(c) Database Software 1986

...and at a price

Mini Office II offers the most comprehensive, integrated suite of programs ever written for the BBC Micro – making it the most useful productivity tool yet devised.

A team of leading software authors were brought together to devote a total of 26 man years of programming to the development of Mini Office II. What they have produced is a package that sets new standards in home and business software.

The sample screenshots above illustrate just a few of the very wide range of features, many of which are usually restricted to software costing hundreds of pounds. Most are accessed by using cursor keys to move up and down a list of options and pressing Enter to select.

Is it that easy to use? Several leading reviewers have already sung its praises on this very point.

Yet possibly the best advertisement for Mini Office II is that it comes from the same stable that produced the original Mini Office package back in 1984.

That was so successful it was shortlisted in two major categories of the British Microcomputing Awards – the Oscars of the industry – and sold in excess of 100,000 units!

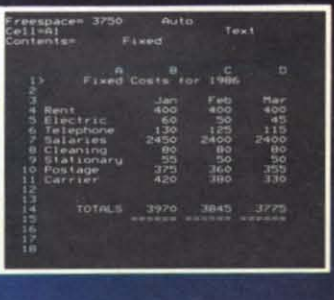
It was up to Mini Office II to take over where the first Mini Office left off, with 32 extra features, two additional modules, a program to convert existing Mini Office files to Mini Office II format, and a 60 page, very easy to follow manual.

This is the package thousands of BBC Micro owners have been waiting for – and at a price everyone can afford!

ONE package!

SPREADSHEET

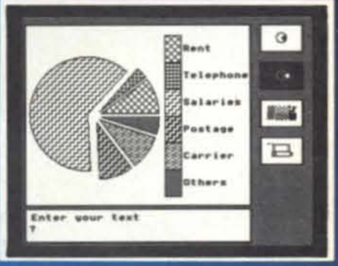
Prepare budgets or tables, total columns or rows with ease, copy formulae absolutely or relatively, view in either 40 or 80 column modes, recalculate automatically – and more!



```
Freespace= 3750      Auto
Cell=A1                         Text
Contents=       Fixed

               A        B        C        D
  1>      Fixed Costs for 1986
  2
  3                    Jan      Feb      Mar
  4 Rent               400      400      400
  5 Electric            60       50       45
  6 Telephone          130      125      115
  7 Salaries          2450     2400     2400
  8 Cleaning            80       80       80
  9 Stationary          55       50       50
 10 Postage            375      360      355
 11 Carrier            420      380      330
 12
 13
 14       TOTALS      3970     3845     3775
 15                 ====== ====== ======
 16
 17
 18
```

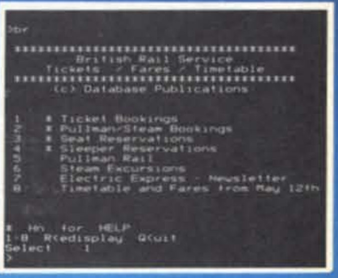
GRAPHICS

Enter data directly or load data from the spreadsheet, produce pie charts, display bar charts side by side or stacked, overlay line graphs – and more!



COMMS MODULE

Using a modem you can access services such as MicroLink and book rail or theatre tickets, send electronic mail, telex and telemessages in a flash – and more!



```
>br

****************************************
       British Rail Service
   Tickets  / Fares / Timetable
****************************************
     (c) Database Publications


1    * Ticket Bookings
2    * Pullman/Steam Bookings
3    * Seat Reservations
4    * Sleeper Reservations
       Pullman Rail
6      Steam Excursions
7      Electric Express - Newsletter
8      Timetable and Fares from May 12th


*  Hn  for  HELP
1-8  R(edisplay  Q(uit
Select    1
>
```

that can't be matched!

Here's what some independent reviewers say about Mini Office II:

Menus throughout the program were abundant and well structured, allowing complex choices to be made with hardly a glance at the pocket-sized spiral-bound manual, and offering a wealth of user-defined functions ... For the money it really is unbeatable. Dedicated word processors, spreadsheets and comms packages may offer some extra facilities, but some are so full of whistles and bells you may find yourself forever in the manual or even not using half of their power. What you get with Mini Office II is a valiant attempt to provide an all-embracing small business package at a down to earth price; it fulfills all its promises, and there's nothing cut-rate about the facilities it provides. – **Viewfax 258 (Prestel)**

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"Daily Mail Home Computing Guide"

DATABASE SOFTWARE

Order form on Page 159

Mike Bibby concludes his series on machine code with a look at indirect indexing

Roundabout way to your address

LAST month we saw how we could use the X and Y registers to index our load and store instructions.

Called absolute indexed addressing, the technique adds the content of the specified register (the offset) to the absolute address accompanying the mnemonic (the base). This calculates the address the instruction applies to. In other words:

```
LDA &7C00,X
```

would mean, if the X register contained, say, &20:

```
LDA &7C20
```

We tend to wrap these indexed instructions in loops, increasing or decreasing the register each time through. Program I illustrates the idea.

You'll probably remember it from last month: It puts five asterisks on the screen – the address &7E80 was chosen to ensure that the asterisks started at the beginning of a line below the listing the assembler puts on the screen.

You should have no difficulty in seeing what's going on. Using Y as our index, we initially load it with five. However, the first thing that happens within *loop* is a DEY to take *Y* to four. We then store *Y* at &7E80+4 – which does not affect the Zero flag of course – and branch back to *loop*. This continues until *Y* has reached zero when the final store is in &7E80+0=&7E80. Our five asterisks will now have appeared on the screen, from right to left.

Upper limit

We tend to use this counting down technique with indexing to avoid an unnecessary compare operation to check when the upper limit of a loop has been reached.

Program II uses this idea to put 256 asterisks on the screen, from &7C00 to &7CFF. Why 256? Well, the *Y* register is restricted in range from 0 to 255. If you work through the program carefully you'll see that the first store is at &7C00, then at &7CFF, &7CFE and so on down to &7C01.

Notice that the DEY is now after the store. Is there a way of achieving the same effect with it before the store?

Incidentally, if you've typed in Program II, you might like to save it, as we'll be using it again later. We'll also be referring to its assembler output:

```
0900
0900           OPT pass%
0900           .start
0900 A9 2A     LDA # ASC("*")
0902 A0 00     LDY # 0
0904           .loop
0904 99 00 7C STA base,Y
0907 88        DEY
0908 D0 FA     BNE loop
090A 60        RTS
```

Suppose, though, that you want to get round this 256 limit. For instance, you might want to fill all 1000 characters of the screen with asterisks.

Well, we can't avoid the restriction on the size of the register, so we'll have to concern ourselves with altering the base address.

Program III shows one way of filling the whole screen. Since using:

```
STA &7C00,Y
```

fills from &7C00 to &7CFF, we simply include the instruction:

```
STA &7D00,Y
```

in the same loop to get the next set of 256. Also throwing in:

```
STA &7E00,Y
STA &7F00,Y
```

fills up the rest of our screen. In fact, it more than does this since 4*256 gives us 1024 characters. This means that we go past the last memory address corresponding to a character on the unscrolled Mode 7 screen – &7FE7 – right onto &7FFF. That's alright, though, since the BBC Micro only uses this extra memory for scrolling.

Program IV shows another way of filling the entire screen – but don't tell anyone you got the idea from me, it's a

```
 10 REM PROGRAM I
 20 MODE 7
 30 FOR pass%=0 TO 3 STEP 3
 40 P%=&900
 50 [
 60 OPT pass%
 70 .start
 80 LDA # ASC("*")
 90 LDY # 5
100 .loop
110 DEY
120 STA &7E80,Y
130 BNE loop
140 RTS
150 ]
160 NEXT pass%
170 CALL start
```

Program I

```
 10 REM PROGRAM II
 20 MODE 7
 30 base=&7C00
 40 FOR pass%=0 TO 3 STEP 3
 50 P%=&900
 60 [
 70 OPT pass%
 80 .start
 90 LDA # ASC("*")
100 LDY # 0
110 .loop
120 STA base,Y
130 DEY
140 BNE loop
150 RTS
160 ]
170 NEXT pass%
180 CALL start
```

Program II

```
 10 REM PROGRAM III
 20 MODE 7
 30 FOR pass%=0 TO 3 STEP 3
 40 P%=&900
 50 [
 60 OPT pass%
 70 .start
 80 LDA # ASC("*")
 90 LDY # 0
100 .loop
110 STA &7C00,Y
120 STA &7D00,Y
130 STA &7E00,Y
140 STA &7F00,Y
150 DEY
160 BNE loop
170 RTS
180 ]
190 NEXT pass%
200 CALL start
```

Program III

bit naughty.

As we've seen, getting past the 256 restriction involves altering the code to take into account different base addresses. Program IV does just this – only to get the different base addresses we use the program to alter itself.

To see how this works, let's go back to Program II. If you look at the assembler output from it you'll see the line:

```
0904  99 00 7C   STA base,Y
```

99 is the opcode for STA absolute indexed with *Y*; 00 7C is the address of *base* in our normal lo-byte, hi-byte fashion.

Suppose, however, that before running our code we alter location &0906 so that it contains &7D instead of &7C. We'll still have the opcode for STA absolute indexed but the base address will be &7D00 – the start address of our second set of asterisks when we're filling the screen. So when we run this altered code we get the second 'quarter' of the screen full of asterisks.

To see this in practice, add the following lines to Program II:

```
190 ?&904=&7D
200 CALL start
```

Now when we run the program we get half the screen filled with asterisks. The first time we call *start* (line 180) our code hasn't been modified so the first quarter of our screen fills. Line 190 then alters the code so that when called with line 200 *start* fills the second quarter of the screen with asterisks.

Program IV uses the idea of modifying code but this time from within the program itself. The assembler output is as follows:

```
0900
0900
0900                OPT pass%
0900                .start
0900 A9 2A          LDA # ASC("*")
0902 A2 04          LDX # 4
0904 A0 00          LDY # 0
0906                .loop
0906 99 00 7C       STA base,Y
0909 88             DEY
090A D0 FA          BNE loop
090C EE 08 09       INC loop+2
090F CA             DEX
0910 D0 F4          BNE loop
0912 60             RTS
```

The effect of *loop* remains unchanged from Program II giving us 256 asterisks on the screen. This time though it's wrapped up in an outer loop – controlled by *X* so that it's performed four times.

```
 10 REM PROGRAM IV
 20 MODE 7
 30 base=&7C00
 40 FOR pass%=0 TO 3 STEP 3
 50 P%=&900
 60 [
 70 OPT pass%
 80 .start
 90 LDA # ASC("*")
100 LDX # 4
110 LDY # 0
120 .loop
130 STA base,Y
140 DEY
150 BNE loop
160 INC loop+2
170 DEX
180 BNE loop
190 RTS
200 ]
210 NEXT pass%
220 CALL start
```

Program IV

Each time the inner loop is performed, though, the asterisks appear further down the screen since before branching back the program changes its own code. It's the:

```
INC loop+2
```

that does the trick. If you look at the assembler output you'll see that *loop+2* is the address of the high byte of our absolute indexed instruction. The first time through *loop* this is &7C so the Ascii code for an asterisk is placed in memory locations &7C00 to &7CFF. On dropping out of *loop* the increment ensures that the high byte is now &7D. We then decrease our outer loop counter, *X*, and, since it won't yet be zero, we branch back to perform *loop* once more. This time the code for an asterisk is placed in &7D00 to &7DFF.

After dropping out of *loop* again, the increment changes the high byte of the indexed store to &7E, *loop* now places asterisks from &7E00 and so on.

It works and it's fun so you won't be surprised to know that it's frowned upon. Self-modifying code is the machine code equivalent of GOTO. Avoid it!

One reason for this advice is that since it alters itself, the code must be resident in ram. You can't put your self-modifying routines into rom, which you sometimes want to do.

The second reason for shunning such code is to make debugging simpler. Since the code itself is constantly altering, working out exactly what's going on and the state of the program when it crashed can be a nightmare. It's easier to know where you're going if you know exactly where you are in the first place.

Thirdly, the potential for crashes is far higher. If you specify the address you want to modify incorrectly then you're likely to be wreaking havoc on your program.

The final reason is program clarity. You might know at the time why there's that:

```
INC loop+2
```

but will you remember what's going on in two month's time? (Incidentally, the last two points are why I used:

```
INC loop+2
```

rather than:

```
INC &908
```

Not only does it make the code far more readable, using labels in this way, it also means that changes in the code such as altering *P%* or inserting extra bytes are automatically taken into account. The address *loop+2*, of course, refers to the byte two bytes further on in memory than *loop*.)

Alterable addresses

However, the idea behind self-modifying code isn't bad: By altering the base address of an indexed operation we can 'extend' our indexing over more than 256 bytes. We don't want to alter the program itself, though. Somehow we need to separate the address we're going to be changing from the code.

What we require is a special area of ram that we can put 'alterable addresses' in. Instead of spelling out such an address directly in the program code itself, our program would then refer the 6502 processor to where it's stored in this special ram – a roundabout, or indirect way of getting to the address. Instead of giving it an address, we give it the address of an address!

Zero page

Well, we've got our special area of ram: zero page. And we've got a way of letting the 6502 know that we're referring to an address that's stored there, known as *indirect indexed addressing*.

What we do is to 'hide' our base address down in zero page. This, of course takes two bytes, the address being stored in usual lo-byte, hi-byte fashion. Our instruction then points to the base address indirectly by specifying the zero page address where it's hidden. If you're being super-precise, it's the zero page address at which the lo-byte is

Turn to Page 57 ▶

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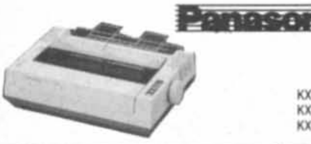

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◀ From Page 55

stored.

To show that it's only a pointer or indirection to where the real base address is stored, we put the zero page address in brackets. Finally, the whole thing is indexed by the *Y* register.

Suppose the 6502 saw the instruction:

```
STA (&70),Y
```

It would interpret the brackets as telling it to look in zero page locations &70 and &71 for the base address to be combined with the offset of *Y*. So, if &70 and &71 contain &00 and &7C respectively, the instruction boils down to:

```
STA &7C00,Y
```

Notice how vital those brackets are:

```
STA &70,Y
```

and:

```
STA (&70),Y
```

are very different instructions.

The first stores the accumulator in memory location &70+Y – the absolute indexed addressing we're used to. The second looks at zero page locations &70 and &71 and uses the address that's stored there as a base to offset with *Y*.

Program V uses indirect indexed addressing to fill the top quarter of the screen with asterisks. Previously we've used absolute indexed instructions of the type:

```
STA base,Y
```

to achieve this. In this case base would be &7C00. Now we're going to use indirect indexed addressing:

```
STA (indirect),Y
```

where indirect is the location in zero page where we've stored base – &7C00 in the form 00 7C.

Initially we have to make sure that our zero page locations do indeed contain, point to or vector this address. Choosing &70 for *indirect*:

```
LDA # base MOD 256
STA indirect
```

puts the correct lo-byte into zero page at &70 while:

```
LDA # base DIV 256
STA indirect+1
```

```
10 REM PROGRAM V
20 MODE 7
30 base=&7C00
40 indirect=&70
50 FOR pass%=0 TO 3 STEP 3
60 P%=&900
70 [
80 OPT pass%
90 .start
100 LDA # base MOD 256
110 STA indirect
120 LDA # base DIV 256
130 STA indirect+1
140 LDA # ASC("*")
150 LDY # 0
160 .loop
170 STA (indirect),Y
180 DEY
190 BNE loop
200 RTS
210 ]
220 NEXT pass%
230 CALL start
```

Program V

puts the hi-byte into &71.

loop is our by now 'standard' code, this time using:

```
STA (indirect),Y
```

to replace our old:

```
STA base,Y
```

Since we've just filled the 'zero page indirection' with the address of *base*, the two instructions are equivalent.

```
10 REM PROGRAM VI
20 MODE 7
30 base=&7C00
40 indirect=&70
50 FOR pass%=0 TO 3 STEP 3
60 P%=&900
70 [
80 OPT pass%
90 .start
100 LDA # base MOD 256
110 STA indirect
120 LDA # base DIV 256
130 STA indirect+1
140 LDA # ASC("*")
150 LDX # 4
160 LDY # 0
170 .loop
180 STA (indirect),Y
190 DEY
200 BNE loop
210 INC indirect+1
220 DEX
230 BNE loop
240 RTS
250 ]
260 NEXT pass%
270 CALL start
```

Program VI

Of course we're only quarter filling our screen. Program VI takes care of this in a similar way to Program IV: We repeat *loop* four times using *X* as a counter.

This time, after dropping out of *loop*, we move onto the next 256 asterisks with:

```
INC indirect+1
```

This increases the hi-byte of the address stored at *indirect* – in other words the address now stored in zero page now points to one page, or 256 bytes further along in memory, ready for giving us our next quarter screenful of asterisks when we branch back to *loop* . . .

Indirect power

Using indirect indexed addressing this way means that our actual program does not modify itself as it runs – just the contents of *indirect*. Bear in mind two points:

- The address in brackets has to be zero page.
- You can only use the *Y* register this way, not the *X*.

These indirect or vectored techniques can be very powerful. Just by altering the initial contents of the zero page locations used so that they point to a completely new address we can get our code to affect different areas of memory. All right, we're unlikely to want 1024 consecutive &2As anywhere else in memory but for real applications – such as transferring the contents of a block of memory to new locations – the flexibility of this approach is ideal: Change two zero page bytes and the whole area of operation of the program is changed.

Switch on to 6502

And that's it – the end of the series. We haven't covered all there is to machine code, but we've touched on most of the major points. I hope I've given you a feel for the fun involved in assembly language programming. If you've followed me so far you'll have no problems in learning the rest on your own.

But if you do find a particular aspect of machine code difficult, why not write in and tell us? If it's of interest to enough people we'll do a special feature on it.

One final piece of advice: You don't learn machine code by just reading about it. So switch on your BBC Micro and get cracking. ■

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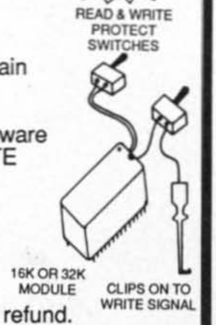

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Your technical questions answered by MIKE COOK

PROBLEM SOLVED

Delayed action

I HAVE an issue 2 BBC Micro and I am encountering the following problems although on power-up everything seems OK.

- After about half a minute of use all keyboard entries begin to repeat at about 10 times normal speed making it impossible to enter a single character except by making a very short stab at the key – Break is the only way to clear the problem.
- Soon after this all keyboard entries cease to be displayed and again Break is necessary to clear this.
- After about half an hour progressively longer periods of normal keyboard entry are possible but the problem never disappears completely, with occasional High-speed or Non-entry occurring, always at the most inconvenient moment.
- Occasionally when a key is held down nothing will print. Then when the key is released a row of that character will print at high-speed.
- In programs with sound the sound also sometimes runs at high speed.
- In the Mini Office II word processor the seconds counter runs at 10 times normal speed when this effect is present on keyboard entry.

Not being able to play with my micro is seriously threatening my sanity so could you please help? – **R.S. Hutchins, Shoreham-By-Sea, W.Sussex.**

● *The fault with your computer is the interrupt system. What is happening is that the computer is being interrupted more often than it should due to a fault in some chip. This has the effect of speeding up the computer's perception of time.*

Now the only problem remains is: which chip? The prime candidate is the system VIA (IC3), a 6522. Try removing this and replacing it with the VIA in IC69, as this chip only looks after the user port and the printer interface the computer will work without it.

If that cures your problems you can get a replacement from Watford Electronics.

Other suspect chips are the A/D converter (IC73) and the ACIA, a 6850 (IC4). Happy hunting.

Radio messages

I HAVE just bought a BBC Master and I would like to know how to make it receive and understand coded messages from a radio transmitter. I am really looking for a set with a maximum range of one mile. – **Malcolm Johnson, Westhumble, Dorking, Surrey.**

● *You do not say what you mean by coded messages, so I am not sure exactly what you want to do. However, the only way you can operate a transmitter is with a Home Office licence.*

There are two types: The CB licence only allows you to transmit speech but the Amateur licence allows you to send speech, Morse code, teleprinter code and Ascii data.

However, it is a requirement of the licence that all transmissions must be in plain language so it is not permissible in this country to transmit coded radio messages.

Exit the colour

I HAVE a 1.2 OS Model B that has given faultless service for the last three years but has now developed a fault.

Colour is present for 30 seconds or so in it's correct form and then it disappears completely leaving a perfectly acceptable black and white picture.

The rest of the micro's performance is faultless and colour does not come on again if it is switched off and back on unless some hours have elapsed. – **Bernard Sheppard, Puddletown, Dorset.**

● *You do not say if you are using the RGB output or a TV set. From the sound of the fault it is a TV set.*

The fault lies in the colour encoder circuit. As it is OK at first I would think your trouble lies in the colour sub-carrier oscillator circuit. Maybe the frequency is drifting or the colour burst is disappearing altogether.

For frequency drift you should try replacing the colour crystal 17.7354 MHz located close to the modulator. However, without looking at the set with test equipment it is impossible to say if this is the fault.

Pole positioner

HAVE you been into an amusements area and seen pole position controlled by a steering wheel, gear stick and a brake pedal? Can this be done on a BBC Micro? – **Alun Jones, Southmoor, Oxon.**

● *Yes it is perfectly possible to build yourself units like this.*

Get a pedal from an old sewing machine and wire it up like a paddle to the analogue input port. The steering wheel should be fitted to a rotary potentiometer and again wired to the analogue input port.

Finally the gear lever should be a switch wired up like a fire button. If you are not sure of the wiring see the May 1983 bodybuilding or page 432 of the Advanced Users Guide.

Now you only have one problem: getting the software to accept these signals. It will be impossible to patch most commercial software but you might just be able to wire this lot up in the same manner as the software expects.

Failing that you will have to write your own.

Making music

I WAS thinking of buying the Acorn Music 500 system but I noticed that you had to connect it up to a hi-fi or midi system. I was wondering if you can connect if up to a normal cassette recorder. – **Ewen Setti, Annan, Dumfries and Gallow, Scotland.**

● *The Music 500 needs to be connected to a hi-fi or amplifier and speaker system, preferably a stereo one, so you can hear it.*

Normal cassette recorders can't act as amplifiers but you should be able to record and playback using one. However, if your recorder can act as an amplifier then the Music 500 could be connected up to that instead of a hi-fi.

Printer control

I AM appealing to you for help as I appear to be hitting brick walls on every path I take.

At present I have a BBC Model B and a Tandy DMP120 printer. The problem is that the BBC will not send the control codes to the printer to set the page depths, lines per page, form feed or print styles and so on.

An example of a command to set a particular style is:

```
PRINT CHR$(27) CHR$(66)
```

This appears not to work on a BBC. Obviously I have already sent the commands *FX5,1 and VDU2.

Can you please give me any guidance or suggestions as Tandy are unable to. – **Roger P.S. Price, Warley, West Midlands.**

● *You cannot send escape sequences to a printer like this because you are also sending them to the VDU driver. You have to send them to the printer alone.*

Do this with a VDU command so for example to what you wanted use: VDU 2,1,27,1,66,3.

Illumination needed

I HAVE used the Light Pen and programs from the October and November issues of *The Micro User* on my BBC using Mode 7. When I upgraded to a Master I found that the programs would run, but not in Mode 7.

The problem appears to be that random numbers are being poked into the light pen registers in Mode 7.

I have tried the same program on

Turn to Page 60 ▶

Your technical questions answered by MIKE COOK

PROBLEM SOLVED

◄ **From Page 59**

other Masters and they do not work in Mode 7, but the same program, run on a dealer's machine and when checked out by Acorn appeared to function correctly.

Acorn refuses to admit that there is a batch of machines that won't support the light pen in Mode 7.

Have you experienced any problems in this area or can you suggest a likely cause? – **G. Bickerton, Sandbach, Cheshire.**

● *Nothing can poke values into the light pen register as this is a read only register in the video controller chip. Therefore I can understand Acorn's attitude.*

There must be something that you are not telling me. I can only think of three possible explanations.

● *The CRT controller chip is faulty.*

● *The light pen line into the CRT controller is being shorted out by some signal that only changes in mode 7.*

● *Something else is going on in the software to corrupt the values being returned from the light pen machine code program.*

Do you get the same results using my test program?

Controlling motors

COULD you please explain how to use the user port on my BBC Micro to control 4 or more motors backwards and forwards?

Is this possible and if not what is the maximum number I can use, and how do I connect them?

Finally, would it be possible to power lights and buzzers the same way? – **David Neward, Lower Pensylvania, Exeter.**

● *You'll find all you need to know about controlling motors from the user port in the Bodybuilding articles in the May 1984 (stepping motors) and November 1985 (DC motors) issues of* The Micro User.

If you need extra user ports see the Bodybuilding article in the August 1984 issue (4 extra user ports). Basic use of the User Port is described in the Bodybuilding articles from July 1983 to September 1983.

Blowing eproms

HAVING missed out on some of the earlier issues of *The Micro User*, I am now a regular and eager reader.

I now have some spare 8k eproms and would like to blow several Basic Extensions and Utilities on to one Eprom. How can I do this?

Many thanks for a great magazine. – **Bill Tottle, Portchester, Hants.**

● *This is easier said than done. First get an eprom programmer and then decide if your programs are going to run in eprom or are going to be moved out into ram for execution. Either way you have to modify your program to suit.*

Then you need to put the correct header into the eprom and details of this can be found in the Advanced User Guide but note that it only applies to machine code programs.

*You can have Basic programs in eprom and fish them out using the *ROM command to change to the rom filing system.*

This behaves rather like a read-only disc. The header for this is more complex but if you get the Watford eprom programmer the software does this for you.

Also, very soon, The Micro User *intends to publish a utility to do all this automatically.*

Disc copier

PLEASE could you inform me if there is a tape to disc copier for the Acorn ADFS, compatible with the Master Turbo?

Also could you tell me what Rory McCloy means when in the August 1986 issue, page 20 second paragraph, he says "...27512(64k) and 27256(128k) but not 27512"7?

Also please can you tell me what !BOOT means? – **G.H. Lyons, Northwood, Middx.**

● *I know of no automatic tape to disc copier for the ADFS. Most of the ones for the BBC DFS are very limited in what they will cope with anyway.*

There was a misprint in the article and the last part of the sentence should read, "...as well as 27128 (16k) and 27256 (32k) but not 27512 (64k)."

*The numbers on roms are measured in bits, not bytes, and most have a prefix of 27. There are eight bits in a byte, so a 16k (byte) rom holds 16*8 = 128k bits and its number is 27128.*

!BOOT (pronounced pling-boot) is the name of the file the BBC tries to access when automatic loading from disc is required, usually this is done by pressing Shift+Break.

You'll find details in any book on the DFS.

Danger signals

I WONDER if you can help me with an incipient problem which has appeared on my issue 7 BBC Micro.

When the machine is cold I have trouble powering up: I switch on and nothing appears to happen. If I give the switch, or the plug switch a flick it then powers up in the normal way. That is to say, I hear two bleeps, one low, one high.

It obviously isn't any trouble to repower, but I am terror-stricken at the possibility of the problem may getting worse and I would like to nail it now.

I have noticed that if the machine is hot and is repowered it sometimes makes slightly different noises, but it has always done this and has given no trouble until recently. – **George Speller, Keighley, Yorks.**

● *This could be one of two things, either the reset circuitry or the power supply.*

If it is the power supply then there is not a lot you can do about it as delving inside there is not recommended.

However, it could be the reset circuitry. To see if it is, the next time you switch on and nothing happens try a control break a few times. If this works then your power supply is probably OK and the reset circuitry needs looking at.

There is not much to go wrong. It could be the 555 chip (top left hand corner) or one of the timing components around it – check for bad joints.

No go drives

I HAVE a BBC Model B fitted with a Watford DDFS and I purchased a twin disc drive manufactured by LVL (now no longer trading).

From the start the drive would not operate with my micro. Fearing I had purchased a faulty drive, I asked a friend at college if he could test both the micro and the drive in the college computer studies class. He did this with the following results:

● The micro would operate college drives, no problem.

● My drive would run on the college BBC Micros.

● My micro and drive will not operate together.

Could my problem be anything to do with the DDFS. I am afraid I do not know what DFS system was used in the college machines – **F. Theobald, Sidmouth, Devon.**

● *You seem to have tried everything.*

Given the results of your tests there is no reason why your drives should not work on your computer. I can only suppose the tests differed in some small respect that you are overlooking.

For example the power supply or the connecting leads – were these the same in the two tests? Try to ensure every possible variable is controlled.

Your problem will be quite simple once you have found it but without proper test equipment it might be difficult to find. As a last resort a dealer should be able to fix it for you.

MULTIPROM
EPROM PROGRAMMER

MULTIPROM allows the experienced user to program 2764, 27128, 27256, 27512, 27513 and 27011 EPROMs, including "A" version. Programming of 27256 up types is carried out in 16K blocks to ensure MULTIPROM compatibility with all models of BBC from B to Master. The UVP 1.1 software requires DFS and a disc drive for operation.

The fully cased MULTIPROM plugs into the user port on the BBC microcomputer, taking power directly from the computer, with an onboard converter providing the programming voltage. Two switches with LEDs are provided, one powering down the MULTIPROM to insert or remove an EPROM from the Textool ZIF socket, and one for Vpp on/off. DIP switches enable swift configuration of the MULTIPROM for each type of EPROM. The necessary UVP 1.1 software, which includes fast programming algorithm, is available on Sideways ROM and contains the following commands: – *TEST (blank check), *READ (afsp) (read Eprom to disc), *BLOW (afsp) (blow EPROM with names file), *VIEW (look at contents of memory from &2000), *COMP (afsp) (compare contents of EPROM to disc). When using *VIEW & *COMP, data is displayed in hex and ASCII format.

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The Pointer ROM is supplied instead of the Icon Artmaster disc and enables the Tracker ball to work directly with the MASTER series computers. (e.g. to use with TIMPAINT etc.). Prices are the same as for the standard tracker ball.

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The Pointer Rom is available separately for people already owning tracker balls, and comes with instructions for use with the MASTER computer.

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This new release from Pineapple is a printed circuit board draughting aid which is aimed at producing complex double sided PCB's very rapidly using a standard BBC micro and any FX compatible dot-matrix printer.

The program is supplied on EPROM and will run with any 32k BBC micro (including Master series). Also supplied is a disc containing a sample PCB layout to demonstrate the programs features.

By using an EPROM for the program code the maximum amount of RAM is available for storing component location and ASCII identification files etc. (Up to 500 components and 500 ASCII component descriptions may be stored for a given layout). These is no limit to the number of tracks for a given PCB, although the maximum size of board is restricted to 8" * 5.6".

Using a mode 1 screen, tracks on the top side of the board are shown in red, while those on the underside are blue. Each side of the board may be shown individually or superimposed. A component placement screen allows component outlines to be drawn for silk screen purposes and component numbers entered on this screen may be displayed during track routing to aid identification of roundels.

The print routines allow separate printouts of each side of the PCB in a very accurate expanded definition 1:1 or 2:1 scale, enabling direct contact printing to be used on resist covered copper clad board.

This program has too many superb features to describe adequately here, so please write or 'phone for more information and sample prinouts.

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VISA

Mike Cook explains the Temporal Operating System Supervisor

TOSS in a wild card

TOSS is an acronym for Temporal Operating System Supervisor and is a new technique that holds the promise of greatly increasing the computing power of any micro.

At the moment it is undergoing field trials and is available only as a pre-production prototype chip, TOSS 0.1, for the Acorn Master.

The chip is massive, 1Mb, the same size as all the Master's bundled software.

As the name implies, it is a supervisor program for the operating system, that is it sits on top of the operating system and makes it run at maximum efficiency.

This ensures maximum compatibility with existing software. However, for programs that will not run on the new system due to software protection and the like, there is a new command to disable it.

To explain how it works, consider a computer chess program. The computer analyses the current position and then makes the best move.

Then it is your turn to move and the computer waits for your response. The time spent waiting is in effect wasted.

Now suppose that the program is written so that the computer carries on analysing the position while you are thinking out your response.

It then only has to take a quick look at the keyboard every half second or so to see if you want to make your move, and the result is that the chess program plays a much better game because it has longer to analyse the situation.

It has done this by utilising otherwise wasted time. This is exactly the principle used by TOSS.

Suppose you are writing a program. You may list it, read the listing to check for errors and then type RUN.

The time spent reading the listing is effectively wasted. What TOSS will do is to issue the RUN command after the listing in anticipation of you typing RUN.

Of course you might not want to run your program, which is why Toss caches any output in a ram buffer until you issue the RUN command.

If you type anything else but RUN, for example if you edit a line, the RUN is aborted and your command is obeyed.

In fact TOSS is continually inserting a RUN command after each operating system command in anticipation of the real thing.

Where TOSS really achieves maximum performance is inside your program, when you use the INPUT command.

TOSS ensures the program keeps on running and checks the keyboard periodically for your input.

The results with graphics programs and dim-witted users can be quite startling.

While they are searching for the spacebar TOSS ensures the program keeps on running, caching the output ready for you.

In the event of your input resulting in the program following two possible paths TOSS implements a multi-tasking system and follows both.

The concepts incorporated in TOSS are being used for research into the next computer breakthrough, which is currently named Super Toss.

This uses a new hardware chip, Future Operations Organising Logic, which correlates all possible actions and reports back the most likely event.

With this chip the TOSS system will no longer spend computing time hoping for an event because it will know it is coming.

When the program branches, TOSS will know which branch will be taken – the potential for increased computing throughput is enormous.

It is even possible to spot syntax errors before you type them in and call up a Help file to display the correct syntax!

However the problem with this extension at the moment is the chip's capacity, as it can only handle events likely to happen 0.8 seconds into the future.

But it is hoped to extend this to up to 5 seconds for the production units.

Any extra extension of event prediction time will have to wait until the ESP chip is developed using the new organic electronic techniques.

Early experiments indicate that a prediction time of up to one hour may be possible.

This would have enormous potential because, for example, it could produce a final, debugged program in seconds which would normally have taken an hour to produce.

You should note that this will work only if you could have produced the program in the first place, as it only predicts what you could do.

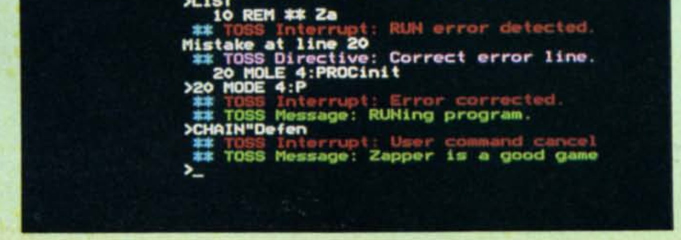
This could well face the user with a dilemma, for if you use the computer with the chip enabled you will not gain the experience that you would if you had without it.

Therefore you will always be stuck at the same level of expertise and never learn anything new.

Super TOSS is potentially such an advance that Acorn could drive all other computer manufacturers out of the market.

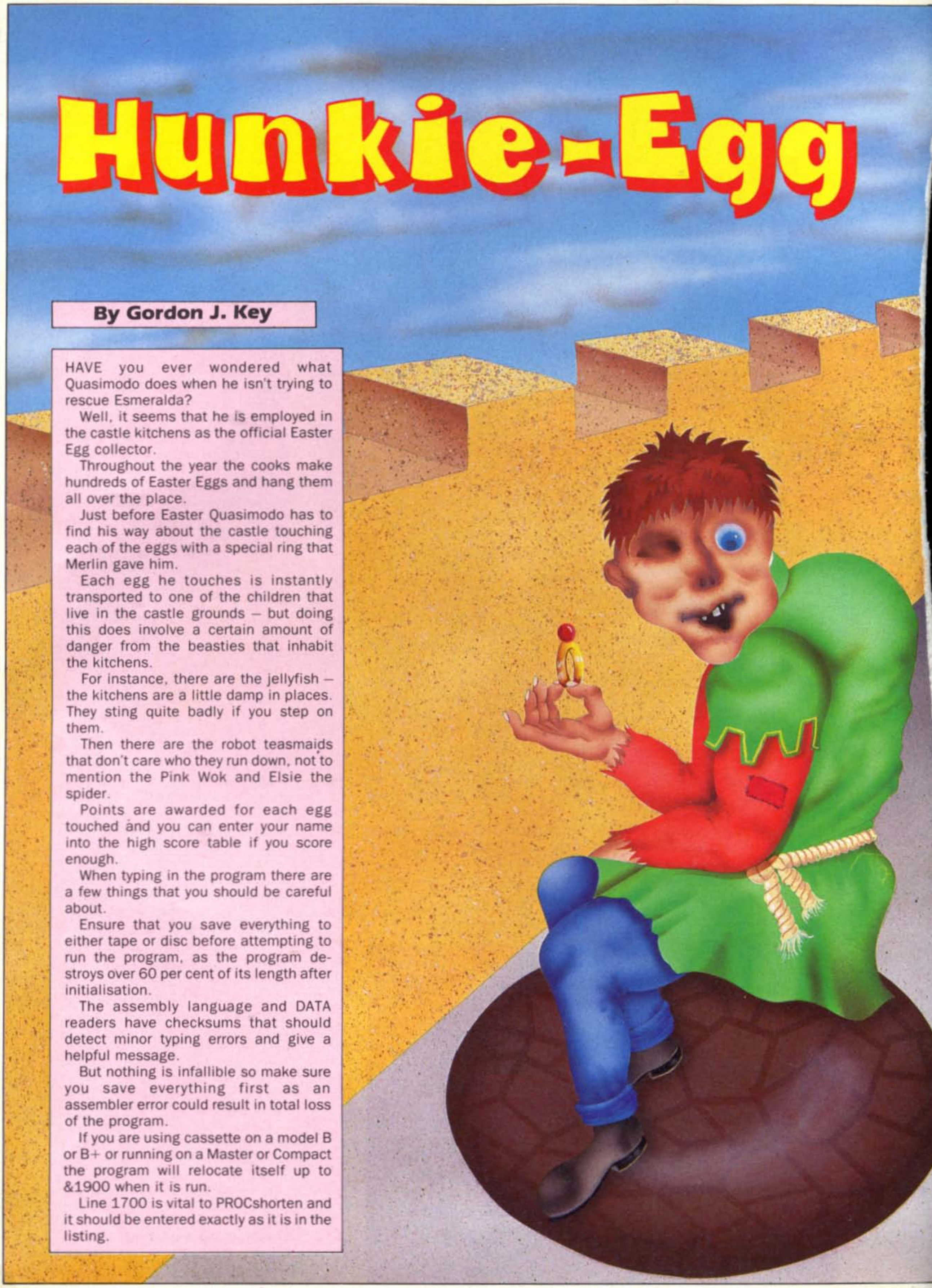
It could revolutionise the gambling industry and increase personal productivity by untold amounts.

At the current development rate, Super Toss and the FOOL chip will be available early April 1988.



```
Clawsoft TOSS 4M

Acorn OS 64K

Acorn 1770 DFS

BASIC

 ** TOSS Message: Zapper loaded.
>LOAD"Zapper"
 ** TOSS Reminder: Already loaded.
 ** TOSS Message: RUNing program.
>LIST
   10 REM ** Za
 ** TOSS Interrupt: RUN error detected.
Mistake at line 20
 ** TOSS Directive: Correct error line.
   20 MOLE 4:PROCinit
>20 MODE 4:P
 ** TOSS Interrupt: Error corrected.
 ** TOSS Message: RUNing program.
>CHAIN"Defen
 ** TOSS Interrupt: User command cancel
 ** TOSS Message: Zapper is a good game
>_
```

Hunkie-Egg



By Gordon J. Key

HAVE you ever wondered what Quasimodo does when he isn't trying to rescue Esmeralda?

Well, it seems that he is employed in the castle kitchens as the official Easter Egg collector.

Throughout the year the cooks make hundreds of Easter Eggs and hang them all over the place.

Just before Easter Quasimodo has to find his way about the castle touching each of the eggs with a special ring that Merlin gave him.

Each egg he touches is instantly transported to one of the children that live in the castle grounds – but doing this does involve a certain amount of danger from the beasties that inhabit the kitchens.

For instance, there are the jellyfish – the kitchens are a little damp in places. They sting quite badly if you step on them.

Then there are the robot teasmaids that don't care who they run down, not to mention the Pink Wok and Elsie the spider.

Points are awarded for each egg touched and you can enter your name into the high score table if you score enough.

When typing in the program there are a few things that you should be careful about.

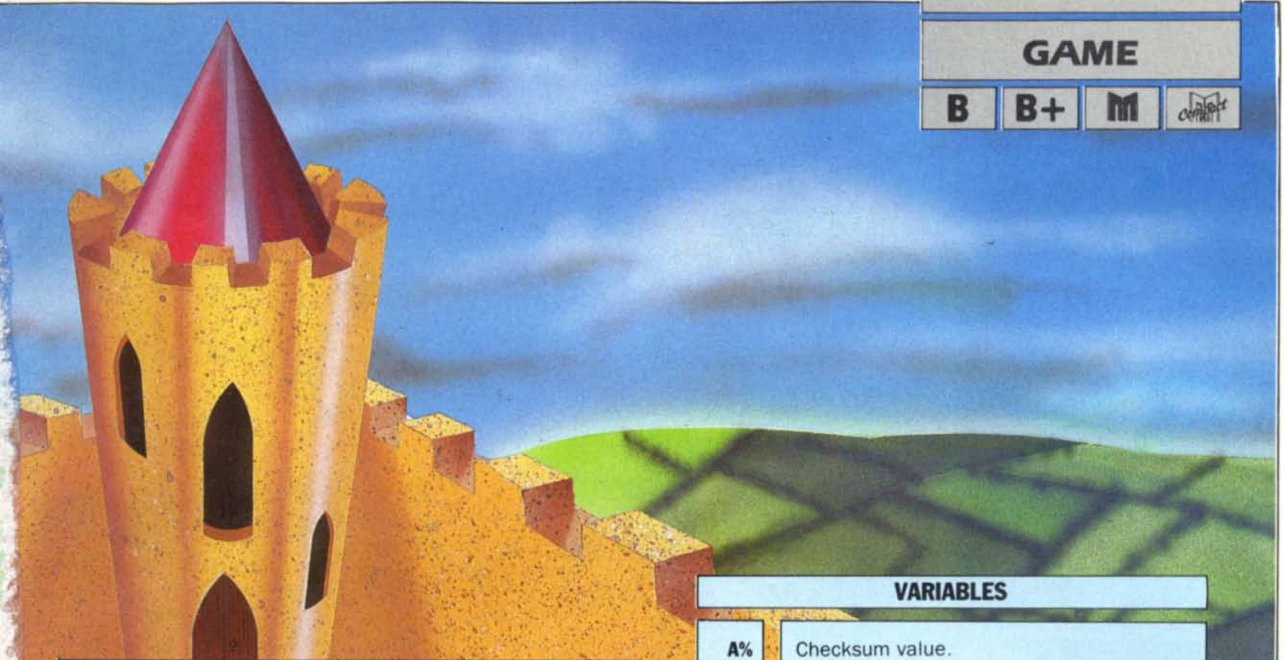
Ensure that you save everything to either tape or disc before attempting to run the program, as the program destroys over 60 per cent of its length after initialisation.

The assembly language and DATA readers have checksums that should detect minor typing errors and give a helpful message.

But nothing is infallible so make sure you save everything first as an assembler error could result in total loss of the program.

If you are using cassette on a model B or B+ or running on a Master or Compact the program will relocate itself up to &1900 when it is run.

Line 1700 is vital to PROCshorten and it should be entered exactly as it is in the listing.



PROCEDURES

game	Controls main game loop.
on	Places the sprites on the screen.
b	Moves the baddies.
s	Calculates the moves for the spider and wok.
t	Calculates the moves for the jellyfish.
i	Calculates Quasimodo's position on the screen.
h	Gets keyboard entry; Secondary part of PROCi.
j	Makes Quasi jump.
k	Makes Quasi fall.
ns	Prints the next screen when all the eggs have been collected.
scrol	Clears the screen by scrolling to the left.
cl	Makes Quasi climb a ladder.
l	Makes Quasi walk.
u	Decides if there is a ladder for Quasi to climb.
mode(M%)	Selects Mode *M%* with VDU22 then removes the cursor.
init	Sets up the initial variables.
hisc	Displays the high score table.
bel(N%)	Makes a bell-like sound.
head	Prints the heading for the high score table.
mup	Calculates the new high score table.
gname	Gets a new name for the high score table.
lines	Draws a pair of horizontal lines.
scn	Displays the current screen.
start	Sets the start-of-game variables.
pl	Prints the current screen number.
draw(M%)	Prints individual characters for PROCscn.
code	Assembles machine code.
stop(C%,O%)	Prints an error message if a checksum does not tally.
s(S%)	Used by PROCcode to skip *S%* bytes.
read(a%,B%,C%,O%)	Reads a word of DATA.
shorten	Shortens the program so that Mode 2 can be selected.
relocate	Relocates the program to Page &19.

VARIABLES

A%	Checksum value.
B%	Start address for screen map.
C%	Checksum target.
D%	Constant value of –105.
E%	Jump length.
H%	Position of Quasi on a ladder.
I%	Current baddie sprite number.
J%	Jump flag.
L%	Constant value of –98.
M%	Sprite number to be used for Quasi.
N%	Bell pitch
O%	Error number.
P%	Call address for the sprite routine.
Q%	Call address to reset all sprites.
R%	Constant value of –67.
S%	Screen map offset.
T%	Counter.
U%	Constant value of –73.
V%	Number of baddies.
W%	Current screen position of robot teasmaid.
X%	X coordinate of Quasi.
Y%	Y coordinate of Quasi.
Z%	Current screen position of Quasi.
U	Screen map Y pointer.
S	Screen map X pointer.
Q	Dummy variable.
g%	Target number of eggs.
h%	Number of eggs touched.
i%	Counter.
j%	Jump counter.
l%	Number of lives
p%	Constant value of &75.
r%	Current room.
s%	Current score.
u%	Position flag.
x%	Jump X value.
a%()	Baddie X coordinate.
b%()	Baddie Y coordinate.
c%()	Baddie X step value.
d%()	Baddie Y step value.
e%()	Baddie screen map position.
f%()	Baddie ladder counter.
hs%()	High score table values.
hs$()	High score table names.

Full listing starts on Page 138 ▶

INSTANT

DATABASE SOFTWARE
Mini Office II
BBC Micro
Model B, B+
Mini Office II
Main menu
Word Processor
Database
Spreadsheet
Graphics
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Label Printer
Exit Mini Office II
Use cursor keys to choose then press RETURN
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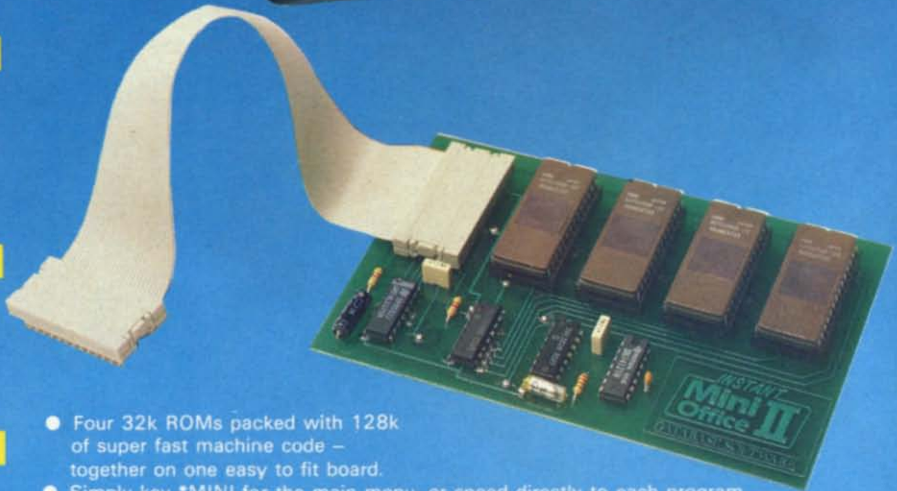
The original Mini Office II is still available on tape and disc. Existing owners of tape or disc versions can exchange them for Instant Mini Office and save £8. See the coupon alongside.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EDUCATION NEWS

Domesday on show

Shiraz Jessa, Watford Electronic's technical director, watches the demonstration with staff and pupils from Hangers Wood School.

ONE of the leading suppliers to the BBC Micro education market has stepped in to answer a plea for help from a school for the handicapped.

Pupils at Hangers Wood School in South Oxhey, Watford, wanted to see the Domesday Project, but the school couldn't afford to buy it. So kind-hearted staff at Watford Electronics offered to demonstrate the Domesday Project to the school.

The Advanced Interactive Video project, the equivalent of more than 300 weighty volumes on just two 12in video discs, is an electronic portrait of contemporary Britain.

But at more than £4,000 plus for the Acorn laser disc based project, along with the equipment to run it, it's out of reach for many schools, including Hangers Wood.

However with Watford's help, six teenage pupils and three members of staff were able to see for themselves the system that took a million people two years to complete.

Shiraz Jessa, technical director at Watford, said: "We were only too happy to help the children. It is a fascinating project".

Hangers Wood is a council-run school with 44 physically handicapped pupils.

Free teletext software

BBC Enterprises has begun providing free teletext system software for Acorn Econet users. For the first time Ceefax and Oracle will be available on Econet through a single Acorn teletext adapter, where previously each machine on the network needed its own adapter.

And it is no longer necessary to go off Econet to access and download Ceefax and Oracle pages.

Any station on the Econet network can now have access to the full range of teletext facilities and any teletext page from any channel can be displayed.

Interactive software can be used on the network to take information directly from any teletext page and use it as data. A time-out feature avoids time-wasting searches by telling the user when a requested page is not available.

Programs and documents can be date and time stamped from Ceefax for saving to disc, and the system will even operate across a "bridge" connecting two or more networks together.

A spokesman for BBC Telesoftware told *The Micro User:* "The software will be available from BBC2 Ceefax and will be repeated at very frequent intervals throughout the spring".

● The Acorn teletext adapter is available as a special mail order offer to readers of *The Micro User,* Page 98.

Legal aid for school

A GROUP of children from a school in Kent made legal history when they used their BBC Micros to contact a London firm of solicitors.

The firm, Pennefather and Co, had just broken fresh ground by offering to answer legal queries via computers – over the MicroLink electronic mail service.

Sharp-eyed pupils from Swadelands School in Kent were the first to see the electronic mail announcement and the introductory offer of one free consultation.

Keen to be at the forefront of new technology, the pupils decided to put the offer to the test.

A variety of questions were sent to Pennefather and Co via the MicroLink service.

"If I wrote a book, would I get the money for it?"

"Can I legally collect money for charity by carol singing?"

"If my grandmother left me all her money, could my parents object?"

"If my parents divorced, could I choose the parent to live with?"

Says John Pennefather: "We expected a good deal of interest from individuals and businesses, but did not think our announcement would cause a stir among schoolchildren.

"We were greatly encouraged when Swadelands pupils decided to put our service to the test.

"After all, it is the schoolchildren of today who will take this form of communication for granted in the future".

The special offer of a free consultation is open to all MicroLink subscribers as an introduction to this online service.

"It's also to give people a taste of the way solicitors will handle their work in the future", says Mr Pennefather.

Japanese course

A COURSE aimed at teaching Japanese with the aid of BBC Micros has been set up by Duncan Baker of the Lydbury English Centre, Shropshire.

Aimed at UK business people who trade with Japan the residential course lasts five days.

Duncan is looking for four businessmen to fill the remaining places on the course which runs from May 10 to 15.

Laboratory line-up

DESIGN Consultancy of Norwich has produced a system which they hope will clear the decks in science and engineering departments.

The idea behind the Oasis Virtual Instrument System (VIS) is that students can use it with just the laboratory computer instead of having to cope with a conglomeration of multi-meters, oscilloscopes, chart recorders, plotters and interfaces.

The VIS serves as a multi-channel precision voltmeter, oscilloscope, up to and including audio frequencies, a data logger, chart recorder and x/y plotter all in one.

The Oasis VIS costs £399 which includes a data converter, connectors, instrument emulation software and documentation.

The most adventurous and original way to test your French ever devised.

FRENCH
on the
RUN!

The adventure game with a big difference.

£9.95 cassette
£11.95 5¼" disc

You're on your own in Occupied France — facing the toughest test that a British pilot has ever had to experience!

The year is 1943. As an RAF officer stranded in Occupied France you have one aim – to get back to Britain.

The only way to do this is to try to pass as a Frenchman, but if your French isn't good enough you risk capture and interrogation by the police or even the Gestapo.

Even the simplest tasks – from buying food to taking buses – place you at risk. And to add to your problems you've got limited funds: "Should I hitch a lift or take the train?", "Do I sell my belongings or get a job?"

Whatever you decide to do, time is short. And there are always people willing to denounce you . . .

French on the Run is that rare combination: A truly educational program that's also a thoroughly enjoyable game. This text adventure not only tests your grammar and vocabulary, but your knowledge of France and the French way of life.

And as your French improves the language problems get harder and the situations become progressively more dangerous. There are four routes to complete in sequence – you need the password from the last before attempting the next. The standard of French required is about O level, though on the last route it rises to just below A level.

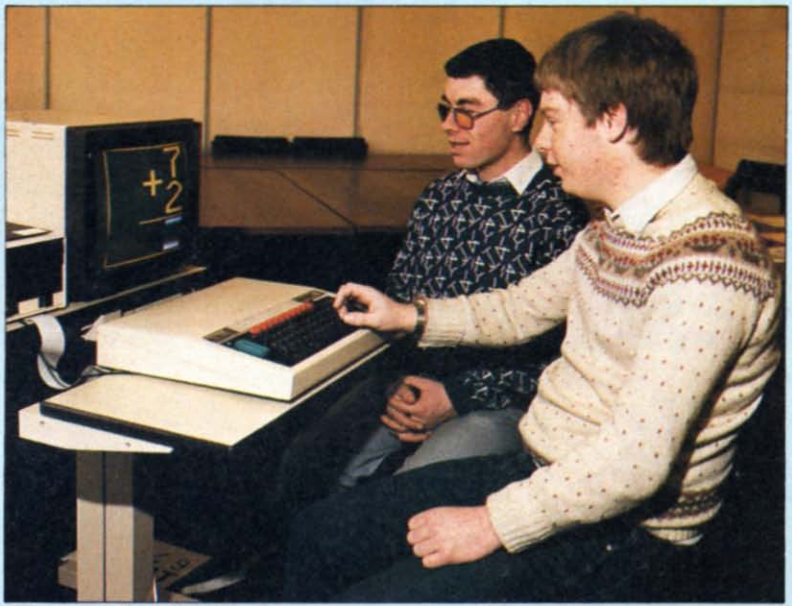
And there's a chance for you to try out the French you'll learn in practice: We are offering a FREE WEEKEND IN PARIS as a prize to the first person to get back to England alive, having broken a code near the end of the final route.

For teachers: *French on the Run uses multi-choice questions with randomised distractors, all carefully chosen to illustrate linguistic points or points concerning things French. The program is meant for individual assessment, but can be used just as effectively for classroom work. A sealed envelope contains details of how the secret passwords are created.*

DATABASE SOFTWARE

TO ORDER TURN TO THE FORM ON PAGE 159

EDUCATION THEME



Trainees use the arithmetic program

Programming for disabilities

By Mark Smiddy

UNTIL a few years ago the computer was an expensive luxury usually hidden away in the back rooms of universities or in the accountancy departments of giant corporate businesses.

All that changed with the advent of the microprocessor: Machines like the ZX81, and later the BBC Micro, soon became an essential part of all of our lives.

They do our accounts, help to teach our children and entertain us with a bewildering array of games.

They can also be used as a valuable teaching aid, not only for the three Rs, but for developmental work where coordination skills and concentration need to be improved.

In the North East of England, one social services Department is forging ahead with a scheme which is tailor-made to suit the needs of mentally handicapped people and those with severe physical disabilities which restrict efficient use of the computer keyboard.

The scheme at Cleveland County Social Services was developed three years ago and has expanded considerably.

Like many other authorities, Cleveland has had excellent results at its centres, heartened by the progress of clients who have been encouraged to learn through using a computer.

The great thing about the micro is that it never gets bored or tired, it never loses its temper and it is always ready to teach.

Perversely, herein lies a problem. A computer is nothing without software and, commercially speaking, it is simply not worthwhile writing tailor-made software for disabled people. There is just no money in it since virtually every program has to be constructed to fit individual needs.

The computer personnel at Cleveland County Social Services department, who are sponsored through a community programme, are now using BBC Micros as teaching aids.

They operate in adult training centres for mentally handicapped people, in centres for physically handicapped people and in children's homes.

A project collectively called Communications and Modern Technology in Mental Health was started in Cleveland in June 1984 to produce tailor-made software for handicapped people.

It was the brainchild of Helen Lockwood and Peter O'Sullivan and is funded by the Cleveland County Community Programme Agency through the Manpower Services Commission.

Initially, the scheme covered the seven adult training centres in the area, but has been so successful that it has expanded very rapidly to include three physically handicapped centres and two children's homes in the county.

All software for the scheme is developed by a small team of programmers working in liaison with the instructors at the centres and the trainees themselves.

When working with the trainees at the centres, in addition to their regular instructor there is also an instructor's assistant (also funded through the community programme) who has been trained in the use of the computers and external hardware.

All the software is written for the BBC Micro and Master, using a variety of peripherals such as light pens, speech synthesisers and the concept keyboard.

"BBC machines were the obvious choice", said Nick Boyne-Cross, project co-ordinator at the time of its inception. "The BBC Micro was already widely used in schools and the existing peripherals such as the concept keyboard from Star Microterminals made it most suitable for our special needs. In fact I do not think that there is another machine available at the price that can match the BBC's versatility".

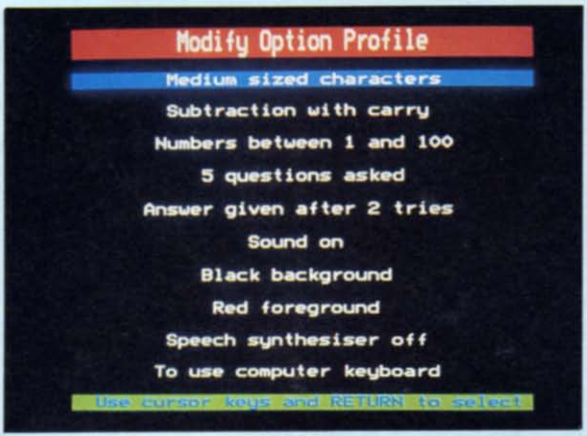
The emphasis placed on the software produced by the project is quality rather than quantity. The team's view is that if a job is worth doing it's worth doing best!

This is not a mere matter of pride, development officer Patricia Tighe said: "We believe that the trainees deserve only the very best and we aim to give them just that".

The actual software produced varies widely, from basic mathematics tutors using very large characters to a word processor using the Braid speech synthesiser and Moon system – a simplified version of Braille – with the concept keyboard.

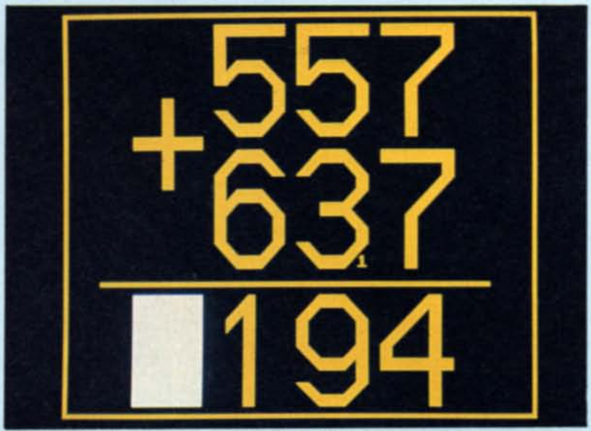
Due to the foresight of the people behind the project even the most sev-

Turn to Page 70 ▶



```
Modify Option Profile
Medium sized characters
Subtraction with carry
Numbers between 1 and 100
5 questions asked
Answer given after 2 tries
Sound on
Black background
Red foreground
Speech synthesiser off
To use computer keyboard
Use cursor keys and RETURN to select
```

A wide range of options are available



```
 557
+637
   1
 194
```

Large characters are clear and easy to read

◀ ***From Page 69***

erely disabled trainees are getting used to communicating with the outside world – some of them for the first time in their lives.

The task of writing software for the disabled is not as straightforward as it might initially seem, as each individual has very special needs.

It is not just, for example, a case of adapting existing educational software to use concept keyboards for external control and expecting trainees with a low degree of muscular control to be able to use it – they won't.

Conversely, it's quite pointless expecting a trainee with a short attention span – or worse, poor sight – to sit in front of screen after screen full of text.

In fact programming for the disabled opens up a totally new can of worms. So where do you go from here? Quite simply – back to basics.

First of all it is essential to understand the problems faced by the trainees you intend to help.

The best way to do this is to visit the educational establishments where they are taught, meet the instructors and speak to the trainees themselves. Anyone not prepared to do this should never attempt to write for the disabled.

By way of illustration I shall take an example from the case file.

John, aged 25, is mentally and physically handicapped but his instructor wanted him to learn basic arithmetic.

This sort of mathematics is essential if John is to be able to lead a more normal life – for example, buying something in a shop and checking that he has received the correct change.

While the actual mechanics of adding and subtracting numbers are relatively straightforward when worked out bit by bit on paper, John could not read normal sized characters, or even the enlarged text available in BBC mode two.

The eventual solution to the problem was a mathematics tutor that explained the sum bit by bit, using numbers that filled a full one third of the screen. This has enabled John to add up two numbers with a result up to 9999.

The basic program has now been amended to include subtraction and addition with or without carry/borrow.

The tutor has proved to be so useful for John that it has now been extended by an options utility that enables the whole configuration to be changed and saved to disc for later use.

This allows it to be used with other trainees at the centre, who may not be so poorly sighted, without the instructor having to wade through pages of a startup menu every time the program is run.

Having to do this would bore the trainees and it is essential to keep their attention, as any teacher will tell you.

The options program allows things such as screen colours to be set. While this may seem to some to be trivial, it is in fact an essential.

Originally the screen colours were yellow letters on a black background. These were chosen by the instructor after reading a study that suggested that poorly sighted people found this combination easiest to see.

Generally speaking this is because these colours display a very high contrast on most monitors.

Try it by turning the colour down on your television. Red and green, for example, give a very low contrast.

However, colour blindness depends very much on the individual. Black and yellow, therefore, may prove to be completely useless.

The clarity of a display depends on the user, not on what makes it look pretty – something worth bearing in mind if you ever get an opportunity to write for the disabled.

Support for the individual does not stop there though and a constant contact is kept with the centres to see how each program may be improved.

Recently John's sight worsened to the point were he could not distinguish even the large characters presented. In direct response to this the programmer has added a speech facility to confirm that the correct input has been made, give scores and so on.

Due to a further deterioration in John's sight he was no longer able to write using pen and paper but it was felt that since the computer has been so successful in helping him to learn maths, it could be used with a new word processor developed specially for him.

This is called Moonwriter and provides John with a simple writing aid. The input comes from a concept keyboard with an overlay containing letters in Moon, an alphabet for the blind and partially sighted similar to Braille. Sentences are displayed on the screen in large characters.

Speech has again been added as a backup to the screen and when he is satisfied with what he has entered, John can use the printer to give himself a hard copy.

Speaking as a programmer to programmers, writing for the disabled is probably the most challenging task most of us can attempt on a micro – but it can also be the most rewarding.

It may not earn you the sort of money that your latest version of a classic arcade game will, but it will earn you a much greater reward than that – the knowledge that you have helped someone, possibly less fortunate than yourself, have a better life.

For further information write to:
The Project Supervisor, Communications and Modern Technology Mental Health, P.O. Box 91, Marton House, Middlesbrough, Cleveland TS4 2EH.

■

INTER WORD

ROM
INTER-WORD
The integrated word processor for the BBC Microcomputer
Computer Concepts

The integrated word processor for the BBC micro

INTER-WORD is fast, efficient and simple to use. Being menu operated the newcomer does not need to remember strange key combinations or command names. The menus are not a burden to the experienced user since there are shortcuts to access many of the features.

Some of its special features are:

• On screen style changes

Underline, bold and a special dotted style are shown on screen exactly as they would appear on the final printout. Also left, centred and right justified text is shown on screen as you edit. What you see on screen is really what you get on the printout.

• Multiple documents in memory

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Built in facilities for printing text in up to 5 columns.

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Simple and fast selection of all INTER-WORD options and page layout.

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Any page or range of pages may be printed, even in multi-file mode, with any number of copies.

20% discount

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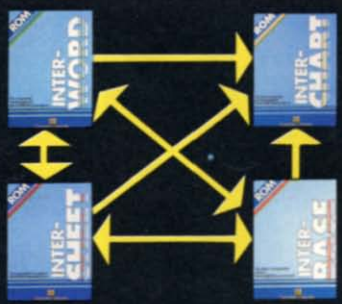
Review

> **"INTER-WORD is the most powerful and comprehensive word processor available for the BBC today. It is more powerful and flexible than View and still retains much of the friendliness and ease of use of Wordwise. Inter-Word looks set to become the standard word processor for the BBC Micro."**
>
> *Beebug, Aug/Sept '86*



Inter-Word is part of the 'ROM Link' series which is the only truly integrated suite of ROMs for the BBC micro.

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Telephone (0442) 63933**

• Block operations

These are common to most word processors, but with INTER-WORD any part of the text can be marked and then instantly moved, copied, deleted, printed, saved, underlined etc. There is no limit to the amount that can be marked.

• Automatic re-formatting

This enables the user to just type—no keys to press to re-format the paragraph after changes to the text or margins have been made; the margins on the rulers can simply be dragged, all text being instantly re-formatted to the new settings.

- **40, 53, 80 and 106 column screen modes**
- **Mail merge**
- **Integrates with all other parts of INTER family**
- **Automatic page numbering, with headers and footers**
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- **Automatic word count**
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- **Line numbering**
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- **Compatible with the B, B+ and Master; Solidisk, Aries and Watford shadow RAM boards.**

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GUARANTEE

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(Available when purchased directly from Computer Concepts)

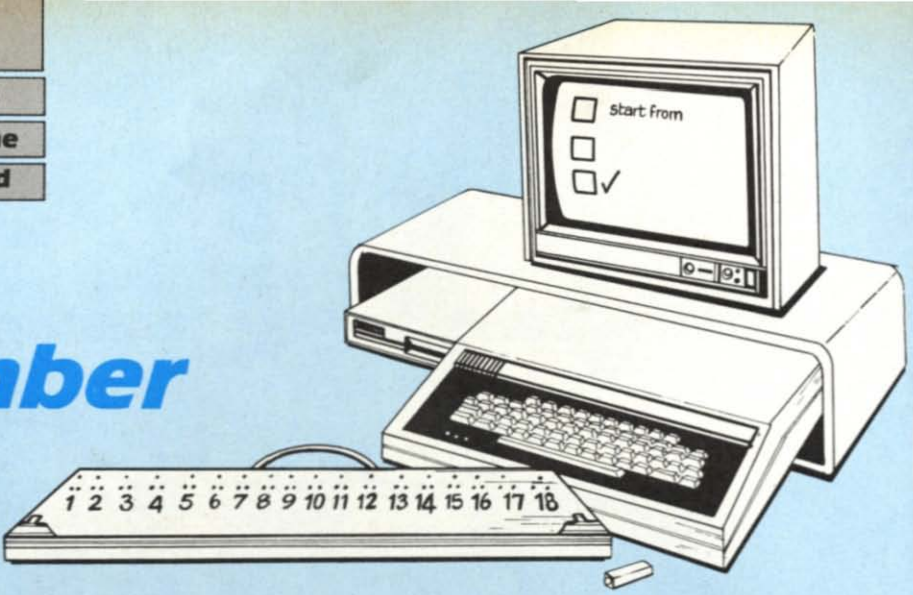
Access VISA

**Access/Barclaycard accepted.
All orders despatched within 24 hours.**

Compatible with all BBC Micros

Gerry Lancaster has an alternative to the BBC Micro keyboard

A number board you can count on . . .



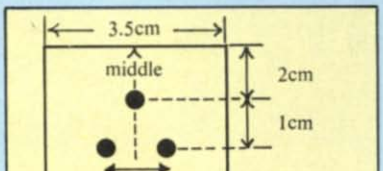
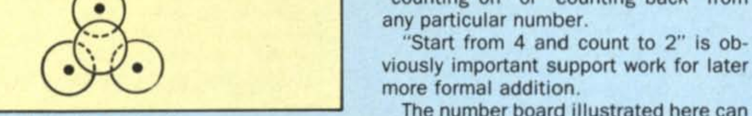


Figure I: Marking out pattern

Number the studs like this on the underside of A



Tin all the points of the studs with a small amount of solder.

Figure II: Pattern connections

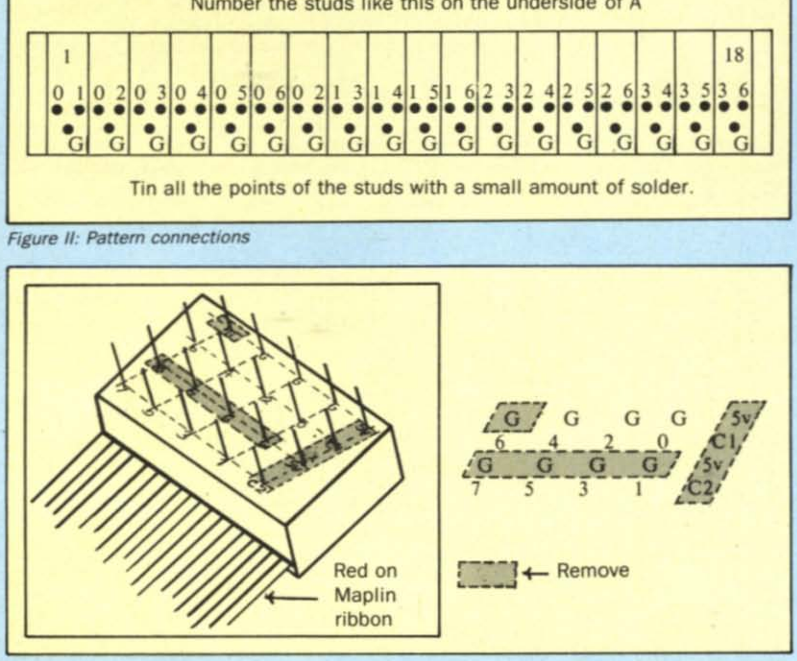


Figure III: Pins to be removed from the block

CHILDREN often know the number sequence, counting from 1 onwards, before they begin school.

Once at school, however, the business of counting things and the later move into adding and subtracting numbers is dealt with in very small stages.

It is much more detailed than most of us can remember. One stage involves "counting on" or "counting back" from any particular number.

"Start from 4 and count to 2" is obviously important support work for later more formal addition.

The number board illustrated here can be used as one more piece of practice, and as vital reinforcement for some of this early number work.

Intended to be used by children aged between four and six supervised by a parent or teacher, the board encourages the actual physical process of "counting on".

As far as the child is concerned, the board replaces the micro's keyboard and numbers can be entered directly from it using a special stylus, or in fact any electrical conductive material large enough to make contact with three studs.

This process of physically counting focuses the child's attention on the numbers themselves and emphasises their identities and positions.

Therefore 12 is a number between 11 and 13 rather than being just a two-digit entry from the keyboard.

Counter, the board's accompanying software – Program II – is menu driven, allowing the selection of questions on addition, subtraction, or a mixture of both.

As the choice at this stage will likely be made by a parent or teacher, the keyboard is used.

The program presents the information to the child in large easy-to-read text and most words are written in lower case.

The numbers for the problems are chosen at random, *hivalue%* controlling the highest number selected.

By reducing this, you can keep numbers low to make for easier calculation. Alternatively, by increasing it work can be made harder.

Once the child has responded using the stylus, the program checks to see if the answer is correct. It keeps a record of any right-first-time answers and also the number of mistakes.

Three attempts are allowed at any question before the correct response is

Figure IV: The BBC Micro connector

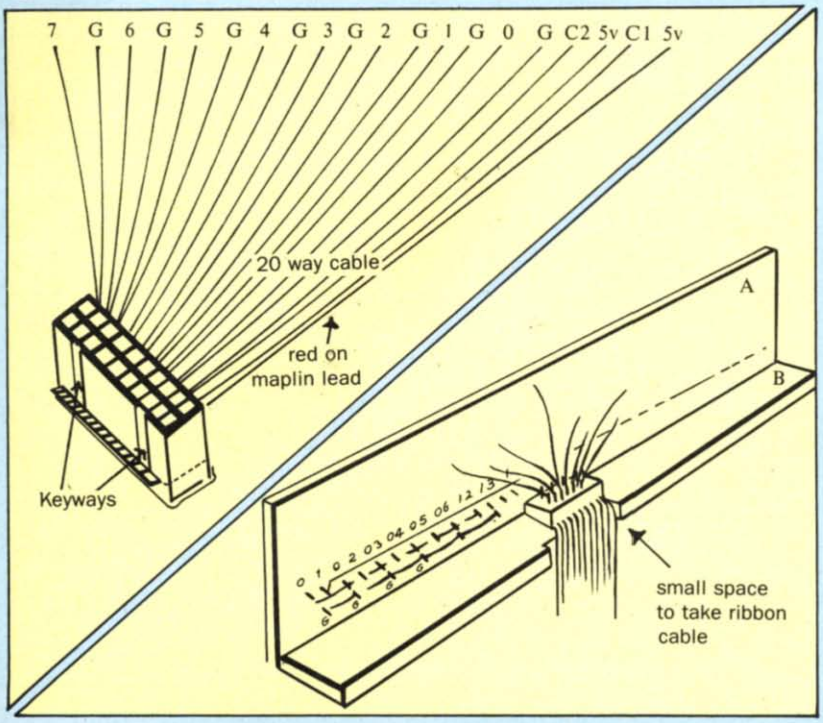

7 G 6 G 5 G 4 G 3 G 2 G 1 G 0 G C2 5v C1 5v
20 way cable
red on maplin lead
Keyways
A
B
0 1 02 03 04 05 06 12 13
G
small space to take ribbon cable

Figure V: The counting block connector

shown and a new question presented. Finally the child's overall performance is reported before a restart is allowed.

For the benefit of disc users the program includes an automatic downloader and it is therefore imperative that you SAVE the program, complete or not, before you run it.

Here's how you go about making the number board:

- Make a marking-out pattern for the studs you are going to use. Figure I shows a suitable design if you are using the Welpac studs. The three studs must not touch each other, but a fourth stud should be able to touch all three.
- Mark lines across one of the A pieces 3.5cm apart. This will give 20 spaces and we will use the middle 18. Mark out the stud positions. Make pilot holes and push the studs through from the top side. Number the studs on the underside, as shown in Figure II.
- All the studs labelled G should be linked by soldering wire connections. Then all studs with the same numbers should be joined in the same way. Colour-coded wiring helps.

We now have to make links to the ribbon cable which will lead to the micro. The Maplin lead has a socket to fit the user port at one end and a plug at the other.

The pins on the plug are shown in Figure III. You can safely remove the pins which have been marked in green – it will make soldering easier and we won't be using them.

Solder 10cm to 15cm lengths of colour-coded wire to the pins numbered 0 to 6 on the diagram and a longer piece to pin 7.

The top row of 3 pins labelled G can be joined with a single wire. Plastic plugs can melt, so be careful.

If you are not using the Maplin lead you should consult Figure IV. It shows the ribbon cable terminations relative to a user port socket. Watch the key-way positions!

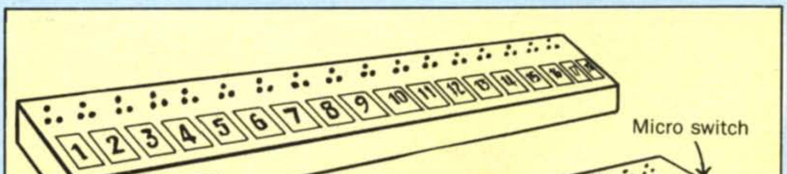
- Pin and glue one of the B pieces along the edge of A nearest the studs. Cut out a small space for the ribbon cable and then use impact adhesive to fix the plug on to the B side – Figure V.
- Join the pins of the ribbon cable to any similarly colour-coded stud using the wires you attached in Step 4 of the instructions above.
- Drill a suitable hole in the remaining B side and fit the push-to-make switch. Pin and glue the B side to the other edge of the studded A side.

Wire the switch to pin 7 on the ribbon cable and any G stud. This push switch has to be pressed to "enter" an answer.

An alternative system can be fitted using two micro switches. Fit a switch at each end of the board and join them with a wooden "spacebar".

Connect the normally open terminals of the micro switch(es) as described for

Turn to Page 74 ▶



Single press-switch replaced by a "space bar" attached to two micro switches.

Figure VI: Two versions of the board

◀ From Page 73

the push-to-make switch. Now answers can be entered by pushing down anywhere along the wooden bar – Figure VI.

Check-out time. With the computer switched off, connect the ribbon cable to the user port. Switch on and enter Program I, then RUN it.

It should show 255 at first. If you hold a coin to connect any group of three studs together you should see one of the numbers from the Decimal column in Table I. Check that all 18 values correspond.

If you press the push switch the program should stop and display a second number, 128 less than before. The only likely faults are poorly-soldered connections, or an upside-down connection to the user-port.

When all is well complete the assembly by fitting the base and the two ends. The numbers on the board can be written on the wood in felt marker pen, or on to brightly-coloured self-adhesive labels which can then be fixed to the board.

You can make a probe by driving a spare upholstery stud into a small piece of dowelling.

State of each user-port line								grounded lines	number at &FE60		number on board
7	6	5	4	3	2	1	0		decimal	HEX	
1	1	1	1	1	1	0	0	0.1	252	&FC	1
1	1	1	1	1	0	1	0	0.2	250	&FA	2
1	1	1	1	0	1	1	0	0.3	246	&F6	3
1	1	1	0	1	1	1	0	0.4	238	&EE	4
1	1	0	1	1	1	1	0	0.5	222	&DE	5
1	0	1	1	1	1	1	0	0.6	190	&BE	6
1	1	1	1	1	0	0	1	1.2	249	&F9	7
1	1	1	1	0	1	0	1	1.3	245	&F5	8
1	1	1	0	1	1	0	1	1.4	237	&ED	9
1	1	0	1	1	1	0	1	1.5	221	&DD	10
1	0	1	1	1	1	0	1	1.6	189	&BD	11
1	1	1	1	0	0	1	1	2.3	243	&F3	12
1	1	1	0	1	0	1	1	2.4	235	&EB	13
1	1	0	1	1	0	1	1	2.5	219	&DB	14
1	0	1	1	1	0	1	1	2.6	187	&BB	15
1	1	1	0	0	1	1	1	3.4	231	&E7	16
1	1	0	1	0	1	1	1	3.5	215	&D7	17
1	0	1	1	0	1	1	1	3.6	183	&B7	18

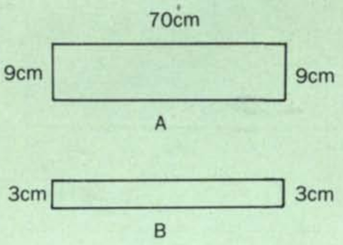
↑ "Wiring diagram" (Compare Figure II)

↑ These are used as DATA statements in program

MATERIALS NEEDED AND COSTS

For the box

You need 2 pieces of plywood or hardwood (A) for the top and bottom and two pieces or more solid wood (B) for the sides.



Two small offcuts for the ends. Panel pin and glue to join A to B.

For the connections to the micro

54 brass studs B&Q DIY sells Welpac brassed upholstery nails at about 40p for 30. These are ideal.

Insulated connecting wire for internal wiring – different colours makes life a lot easier.

Soldering iron and solder.

A 20-way IDC socket for the user-port and 20-way ribbon cable. Maplin sells a suitable length of ribbon cable with the socket ready fitted and a useful plug as the other end. This costs about £3.30.

A push-to-make switch ... about 50p.

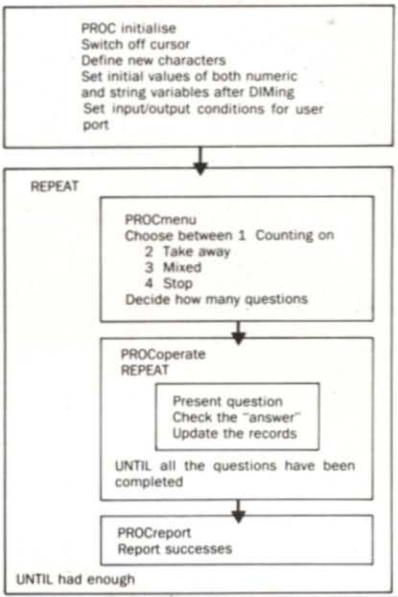
Program I

```
   10 CLS
   20 ?&FE62=08 input lines
   30 REPEAT
   40 PRINTTAB(4,4)?&FE60;:REM Print out
 any input
   50 UNTIL (?&FE60 OR 127)=127:REM Unti
l answer button is pressed
   60 PRINT ?&FE60
```

Program II

```
  100 REM *   Counting Board   *
  110 REM *  by J.G.Lancaster  *
  120 REM * (c) The Micro User *
  130 PROCreloc
  140 MODE1:PROCinitialise
  150 REPEAT REPEAT PROCmenu
  160 UNTIL choice%<>5
  170 right%=0:wrong%=0
  180 PROCoperate:PROCreport
  190 UNTIL FALSE:END
  200 DEF PROCinitialise
  210 A%=RND(-TIME):?&FE62=0
  220 VDU23;8202;0;0;0;
  230 VDU23,244,&1C,&38,&70,&E0,&C0,&80,
0,0
  240 VDU23,245,0,0,0,&10,&39,&1F,&F,7
  250 VDU23,246,&C0,&F0,&3C,&F,3,&E,&7C,
&E0
  260 VDU23,247,&E,&1C,&30,&F0,&C0,&70,&
3E,&7
  270 OK$=CHR$245+CHR$244
  280 bad$=CHR$246+CHR$247+" Try again"
  290 T%=0:over%=0:CH=0:ch%=0
  300 err%=0:hival%=9:port%=&FE60
  310 qst%=1:right%=0:wrong%=0
  320 Q$=STRING$(40," "):Q$=""
  330 W$=STRING$(40," "):W$=""
  340 DIM Q$(5)
  350 Q$(1)="1)  Counting on"
  360 Q$(2)="2)  Taking away"
  370 Q$(3)="3)  Mixed questions"
  380 Q$(4)="4)  Stop"
  390 Q$(5)="5)  Teacher Information"
  400 DIM W1$(2),W2$(2)
  410 W1$(1)="Count on":W2$(1)="more"
  420 W1$(2)="Take away":W2$(2)=""
  430 ENDPROC
  440 DEF PROCmenu
  450 REPEAT CLS:COLOUR1:Q$="M E N U"
  460 PROCdb(Q$,8,2):COLOUR 2
  470 PROCdb(Q$(1),4,6)
  480 PROCdb(Q$(2),4,9)
  490 PROCdb(Q$(3),4,12)
  500 PROCdb(Q$(4),4,15)
  510 PROCdb(Q$(5),4,18)
  520 PRINTTAB(2,22)"Counting-on Board m
ust be used"
  530 PROCin:choice%=ch%
  540 UNTIL choice%<6:CLS:COLOUR3
  550 IF choice%=5 PROCinfo:ENDPROC
  560 IF choice%=4 THEN END
  570 PROCdb(Q$(choice%),4,9)
  580 PROCmenu2:ENDPROC
  590 DEF PROCmenu2:COLOUR2:qst%=1
  600 PROCdb("How many questions?",4,15)
  610 REPEAT PROCin
  620 UNTIL ch%<11:limit%=ch%
  630 PROCdb(STR$limit%,4,24)
  640 IF limit%=0 limit%=10
  650 PROCdelay:ENDPROC
  660 DEF PROCdb(S$,U%,V%)
  670 LOCAL A%,C%,X%,Y%
  680 A%=10:Y%=&A:m=&A00
  690 FOR C%=1 TO LENS$
  700 ?m=ASCMID$(S$,C%):CALL &FFF1
  710 VDU23,240,m?1,m?1,m?2,m?2,m?3,m?3,
m?4,m?4,31,U%+C%,V%,240
  720 VDU23,240,m?5,m?5,m?6,m?6,m?7,m?7,
```

STRUCTURE OF PROGRAM II


PROC initialise
Switch off cursor
Define new characters
Set initial values of both numeric and string variables after DIMing
Set input/output conditions for user port
REPEAT
PROCmenu
Choose between 1 Counting on
2 Take away
3 Mixed
4 Stop
Decide how many questions
PROCoperate
REPEAT
Present question
Check the "answer"
Update the records
UNTIL all the questions have been completed
PROCreport
Report successes
UNTIL had enough

```
m?8,m?8,10,8,240,13,10
  730 NEXT:ENDPROC
  740 DEF PROCoperate:err%=0:CLS
  750 REPEATtries%=0:oldnum%=RND(hival%)
  760 IF choice%=2 OR choice%=3 REPEAT o
ldnum%=RND(hival%):UNTIL oldnum%>1
  770 total%=oldnum%:COLOUR 3:CLS
  780 PRINTTAB(28,2);"Question ";qst%
  790 PROCboardpicture
  800 PROCsquare(85,588,886)
  810 PROCsquare(85,588,556)
  820 PROCsquare(85,588,790)
  830 PROCdb("Start from",4,2)
  840 PROCdb(STR$oldnum%,19,2)
  850 PROCfill((oldnum%-1)*70,100)
  860 PROCcheck1:PROCnumberchoice
  870 PROCcheck2:qst%=qst%+1
  880 UNTIL qst%>limit%:ENDPROC
  890 DEF PROCboardpicture
  900 GCOL0,3:VDU5:LOCAL A%,N%
  910 MOVE0,100:PLOT5,1279,100
  920 MOVE0,200:PLOT5,1279,200
  930 REPEAT N%=N%+1:N$=STR$N%
  940 IF N%<10 N$=" "+N$
  950 MOVE A%,200:PLOT5,A%,100
  960 MOVE A%+8,170:PRINTN$
  970 A%=A%+70:UNTIL A%>1250
  980 MOVE1279,100:PLOT5,1279,200
  990 COLOUR3:VDU4:ENDPROC
 1000 DEF PROCsquare(G%,X%,Y%)
 1010 GCOL 0,2:MOVE X%,Y%
 1020 PLOT5,X%+110,Y%
 1030 PLOTG%,X%+110,Y%+110
 1040 PLOTG%,X%,Y%+110
 1050 PLOTG%,X%,Y%:GCOL0,3:ENDPROC
 1060 DEF PROCfill(X%,Y%)
 1070 X%=X%+8:Y%=Y%+8:GCOL3,1
 1080 old=Y%:REPEAT MOVE X%,Y%
 1090 PLOT 5,X%+54,Y%:Y%=Y%+4
 1100 UNTIL Y%>old+84:ENDPROC
 1110 DEF PROCcheck1
 1120 REPEAT PROCchecker:UNTILtotal%=N%
 1130 PROCsound:PROCdb(OK$,21,12)
 1140 PROCsquare(5,588,556):PROCdelay2
 1150 PROCsquare(85,588,556):COLOUR 0
 1160 PROCdb(OK$,21,12):COLOUR3:ENDPROC
 1170 DEF PROCcheck2
 1180 IF over%=1 PRINTTAB(3,20)"The righ
t number is ";total%:PROCdelay:PROCfill(
(total%-1)*70,100):PROCdelay2
 1190 IF over%=1 IF qst%=limit% COLOUR 0
 1200 IF over%=1 PRINTTAB(3,22)"We can t
ry another question....":PROCbar:ENDPROC
 1210 REPEAT PROCchecker
 1220 IF TIME>T%+100 PROCsound:T%=TIME
 1230 PROCblock(21,(N%-1)*70,100)
 1240 ch%=?port%:UNTIL(ch% OR 127)=127
 1250 IF total%=N% PROCcorrect ELSE PROC
wrong
 1260 ENDPROC
 1270 DEF PROCsound
 1280 SOUND1,-15,60+4*N%,2
 1290 ENDPROC
 1300 DEF PROCnumberchoice
 1310 IF choice%=3 CH=1
 1320 IF CH=1 choice%=RND(2)
 1330 num%=RND(hival%)
 1340 IF choice%=2 REPEAT num%=RND(hival
%):UNTIL num%<oldnum%
 1350 IF num%>(2*hival%) num%=2*hival%
 1360 PROCsquare(5,588,790)
 1370 PROCdb(W1$(choice%),8,5)
 1380 PROCdb(STR$num%,19,5)
 1390 PROCdb(W2$(choice%),23,5)
 1400 PROCsquare(5,588,790)
 1410 total%=oldnum%+num%
 1420 IF choice%>1 total%=oldnum%-num%
 1430 ENDPROC
 1440 DEF PROCblock(G%,X%,Y%)
 1450 X%=X%+8:Y%=Y%+8:MOVE X%,Y%
 1460 PLOT  5,X%+54,Y%
 1470 PLOT G%,X%+54,Y%+84
 1480 PLOT G%,X%,Y%+84
 1490 PLOT G%,X%,Y%:GCOL 0,3:ENDPROC
 1500 DEF PROCcorrect
 1510 IF wrong%=0 right%=right%+1
 1520 COLOUR 2:PROCdb(OK$,21,12)
 1530 IF wrong%=1 COLOUR0
 1540 PROCdb("Well done!",5,21)
 1550 V%=0:REPEAT
 1560 PROCfill((N%-1)*70,100):V%=V%+1
 1570 UNTIL V%>8:PROCsound:PROCdelay
 1580 wrong%=0:PROCbar:CLS:ENDPROC
 1590 DEF PROCwrong
 1600 over%=0:wrong%=1:err%=err%+1
 1610 COLOUR 1:PROCdb(bad$,21,12)
 1620 COLOUR 0:PROCdb(bad$,21,12)
 1630 COLOUR 1:tries%=tries%+1
 1640 IF tries%>2 over%=1
 1650 PROCcheck2:ENDPROC
 1660 DEF PROCdelay
 1670 LOCAL T%:T%=TIME+120
 1680 REPEAT UNTIL TIME>T%:ENDPROC
 1690 DEF PROCdelay2
 1700 PROCdelay:PROCdelay:ENDPROC
 1710 DEF PROCreport:CLS:COLOUR3
 1720 PROCdb("There were "+STR$limit%+"
questions",2,5)
 1730 IF err%=0 PROCdb("All correct.
Very good !",2,25):PROCbar:ENDPROC
 1740 PROCdb("You got "+STR$right%+" rig
ht first go",2,12)
 1750 Q$="You made "+STR$err%+" mistake"
 1760 IF err%>1 Q$=Q$+"s"
 1770 PROCdb(Q$,2,25):PROCbar:ENDPROC
 1780 DEF PROCchecker
 1790 PROCin:N%=ch%:P%=19
 1800 PROCsquare(85,588,556)
 1810 IF N%>9 PROCdb("  ",18,12):P%=18
 1820 N$=STR$N%:IF N%=10 N$="10"
 1830 PROCdb(N$,P%,12)
 1840 oldnum%=N%:ENDPROC
 1850 DEF PROCbar:COLOUR3
 1860 PRINTTAB(3)"Press the answer bar"
 1870 REPEAT UNTIL ?port%=127
 1880 over%=0:wrong%=0:ENDPROC
 1890 DEF PROCinfo:CLS
 1900 PRINTTAB(2,4)"MENU choices can onl
y be entered using the numberboard"
 1910 PRINT'TAB(2)"Use the probe or a co
in to join any"
 1920 PRINTTAB(2)"set of studs together"
 1930 PRINT'TAB(2)"Once questions are be
ing set you use""  the probe or a coin
to select""  your number"
 1940 REPEAT
 1950 PRINTTAB(2,16)"To TEST your answer
 you must press the answer bar when your
 number is flashing"
 1960 PRINTTAB(2,20)"To return to the ME
NU, press""  the answer bar now"
 1970 PRINTTAB(2,16)SPC80
 1980 UNTIL ?port%=127
 1990 ENDPROC
 2000 DEF PROCin:*FX21
 2010 REPEAT REPEAT N%=0
 2020 M%=?port%:RESTORE
 2030 REPEAT N%=N%+1:READ num%
 2040 UNTIL num%=M% OR num%=-1
 2050 UNTIL N%>0 AND N%<11
 2060 UNTIL num%=M%:ch%=N%:ENDPROC
 2070 DATA 252,250,246,238,222
 2080 DATA 190,249,245,237,221
 2090 DATA 189,243,235,219,187
 2100 DATA 231,215,183,-1
 2110 DEF PROCreloc:*TAPE
 2120 IF PAGE<=&E00 ENDPROC
 2130 P%=PAGE:Q%=&E00:*FX18
 2140 L%=TOP-PAGE:FORM%=0TOL%STEP4
 2150 Q%!M%=P%!M%:NEXT:*FX138,0,138
 2160 PAGE=Q%:*K.10OLD|MRUN|M
```

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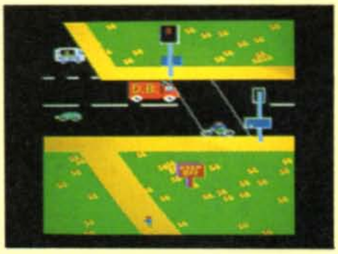
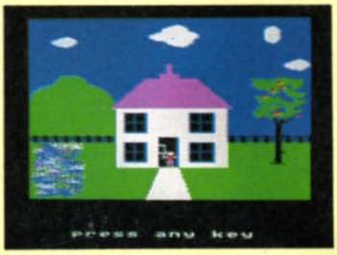
Ages 2-5

- Alphabet
- Colours
- Counting
- House
- Magic Garden
- Matchmaker
- Numbers
- Pelican
- Seaside
- Snap



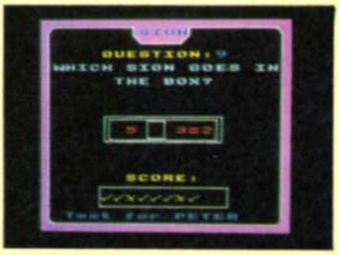
PELICAN
Teach your children to cross the road safely at a Pelican crossing


Press any key

HOUSE
Select the colours to draw a house – hours of creative entertainment

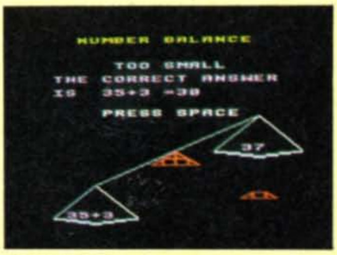
Ages 5-8

- Balance
- Castle
- Derrick
- Fred's Words
- Hilo
- Maths Test
- Mouser
- Number Signs
- Seawall
- Super Spell



QUESTION: 9
WHICH SIGN GOES IN THE BOX?
5 3=2
SCORE:
✓✓×✓✓✓✓×✓
Test for PETER

NUMBER SIGNS
Provide the correct arithmetic sign and aim to score ten out of ten

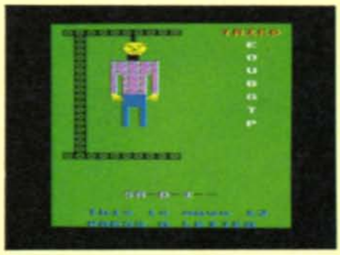


NUMBER BALANCE
TOO SMALL
THE CORRECT ANSWER
IS 35+3 =38
PRESS SPACE

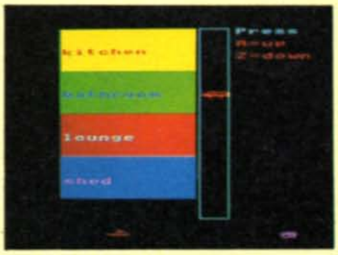
BALANCE
Learn maths the fun way. Type in the answer to balance the scales

Ages 8-12

- Anagram
- Codebreaker
- Dog Duck Corn
- Guessing
- Hangman
- Maths Hike
- Nim
- Odd Man Out
- Pelmanism
- Towers of Hanoi


TRIED
E
O
U
G
G
T
P

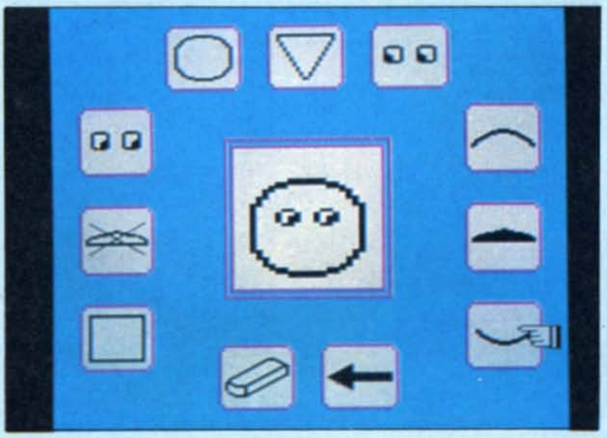
HANGMAN
Improve your child's spelling with this fun version of the popular game


kitchen
bathroom
lounge
shed
Press
A=up
Z=down

ODD MAN OUT
Find the word that does not fit – before your time runs out

TO ORDER TURN TO THE FORM ON PAGE 159

EDUCATION SOFTWARE



Modules to enliven maths lessons

Products: Early Maths Series – Faces (£11), Nasty Games (£11), Grid Games (£15). Available on 5.25in and 3.5in disc.
Supplier: System Software, 12 Collegiate Crescent, Sheffield S10 2BA.
Tel: 0742 682321

THE Early Maths Series is a set of programs presented in three modules, designed to enliven maths lessons. It uses basic ideas taken from the Maths Activity books available from Eigen Publications.

Module One is called Faces and is aimed at five to nine year-olds. For the 8 to 13 age group comes module two, Nasty Games and finally module three, Grid Games, caters for 9 to 16 year-olds.

All three modules aim to encourage logical thinking, whether using symbols as in Faces or numbers in Nasty Games and Grid Games.

As the title suggests Faces involves developing ideas of logic, sets and matching using a face and its components.

The module consists of three programs: Making Faces, Sets and Grid Game (not to be confused with the module Grid Games that we'll come to later). You use the cursor keys to choose the option you require from a menu.

At this stage, as there are no on-screen instructions, you have to constantly refer to the rather flimsy, vaguely-worded eight-page manual.

Making Faces requires you to build a face and introduces the idea of having a smile or frown. The Sets program has you sorting out a series of faces into sets.

If you are successful and make no errors a reward is given: A caterpillar crawls across the screen and eats a carrot.

In Grid Game the concept of sets is developed further by encouraging children to relate the face characteristics to the row and column headings for the grid.

Eight-year-old children initially found the programs attractive but they soon became bored because of a lack of any real challenge.

Younger children, particularly those with little basic numeracy, liked the graphics but needed constant guidance to complete the task. Such supervision is rarely possible in the teaching situation.

Nasty Games is aimed to develop childrens' understanding of place value and it certainly achieves this through a series of light-hearted games which encourage children to outwit each other.

The program begins with Hundreds, an absorbing game for up to six players, with the option for an individual to play against the computer.

Before playing you choose your options: Largest, smallest, odd or even.

With the first option, you play up to eight rounds to beat your opponents to the largest number, using random numbers generated by the computer. A score sheet is displayed at the end of each round.

This game proved to be very popular with eight-year-old children and was probably most successful when used with a group of four.

The second game is called Plus, and as its name suggests deals with addition sums. Each player aims for the sum of his two numbers to be the largest or smallest depending on the game.

Strangely, the program will not allow zero to appear in the tens box, which rather limits your strategy.

When you have filled all the boxes you then complete the given calculation to determine the winner. Again you can choose the number of rounds you play.

The final game is Minus which is identical to Plus except that it deals with subtraction.

It will not allow you to get a negative answer as a result of subtraction, so the top number of the sum must be completed before the bottom boxes can be accessed.

Both Plus and Minus are good educational games: They are enjoyable, demand strategy and are fun to use, but they quickly become repetitive and have limited application.

But Hundreds, the simplest of the games, is a winner. It provokes argument and discussion and, at times, utter frustration. While this is happening the children are learning and reinforcing their understanding of place value.

The third module in this series, Grid Games, is designed to develop children's general facility with numbers and in particular to develop an understanding of multiplication, division and the links between them.

It involves the concepts of breaking a number down into its divisors (factors) and of building a number from multiples.

The Grid Games module is split into two distinct programs, each reinforcing the alternative approach. These are called Divisors and Multiples.

Within each program are four activities: One, Place, Choose and Two. One is the basic activity for a single player.

There is a simple picture scoring

Turn to Page 78 ▶

◀ *From Page 77*

guide to encourage the child and there is an optional dustbin to increase the level of game strategy.

The dustbin option allows you to dump a number into it and retrieve it at a later stage. As the dustbin empties a new number appears in the box and the old number is removed.

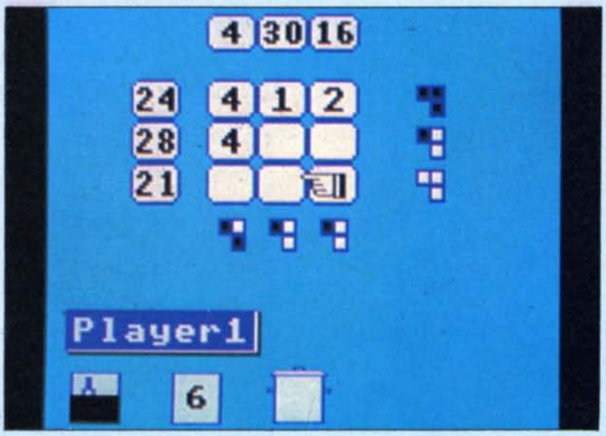
Place first requires you to place the given row and column headings before playing the grid game. Choose offers a selection of heading numbers and you select and place these to maximise your game playing chances.

Two offers a competition between two players using the same grid. A score card is kept to enable players and teachers to observe how individuals are progressing, thus enabling the activities to be used in turn by a number of children.

By using these options the program offers you eight different but very similar games.

Both games require you to have a quick recall of multiplication facts. Without it you simply score low or not at all.

The program offers no teaching facility within it and therefore can only be used to reinforce already acquired knowledge.



This type of activity is readily available in other ways as board or card games – when random numbers are needed a dice would be used.

It's a pity the program doesn't give the child the chance to build his own squares from scratch, as this would present a considerably more difficult task and test understanding of the concepts involved.

Within the primary school maths curriculum this set of programs can undoubtedly find a place.

None of the ideas contained in them are original, nor are they presented in any startling manner, but they do give teachers a source of software which will complement their teaching.

They offer more than just rote learning and they do offer the opportunity to do computer-related activities.

Andrew Heaton

No way to treat children

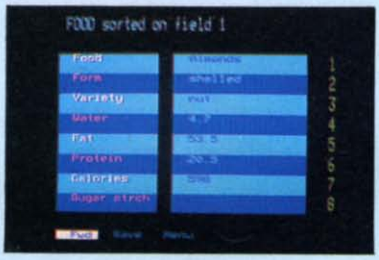
Product: First Filer
Price: £19.95 (5.25in disc) £22.95 (3.5in disc)
Supplier: Chalksoft, PO Box 49, Spalding, Lincs PE11 1NZ.
Tel: 0775 69518

FIRST Filer is a new database that the authors claim is "specially designed for young children, and avoids awkward syntax and funny words".

It comes with a program disc and a data disc, a slim paperback manual and some worksheets. So far so good.

You start by placing your program disc in the drive and booting up with Shift+Break. Be careful which roms you have in your machine – it will conflict with some.

After the title screen I was told to leave the program disc in the disc drive


FOOD sorted on field 1

– actually I had absolutely no intention of removing it. This was my introduction to the rather condescending manner of the programmer.

The next step was to select whether I wanted to use an old file or create a new one. I selected the old file so that I could examine one of the databases supplied.

That went well, but then I received the message "Program disc still in drive?" Well of course it was, and even I know that the program could easily find that out all by itself.

Slightly miffed I replaced the program disc with the data disc and indicated I had done so. Why I couldn't have put the data disc in drive one to save swopping I don't know.

The next step showed a very sloppy programming attitude – the program used *CAT to get the catalogue on the screen then wiped out the top status and bottom file information, leaving a list of the main files. It works, but it is not good programming.

My anger at the programmer got the better of me: I used a file name that didn't exist – Mam – and got the really condescending "Are the Mam files on the disc?". So I typed in No – but the programmer was being rhetorical.

Eventually I loaded a database file and decided to do a search. Find and What seemed to be what I wanted, so I selected What – and was presented with the message "What". And so it went on . . .

I cannot recommend this product for young children, and even the manual says: "Do not expect to be able to use it on the first few occasions without this booklet".

It is condescending, uses meaningless phrases, has inconsistent text entry and during the search routine has a childish attempt at user-friendliness (messages such as "still looking!") just to mask a slow routine.

It is a real shame – Chalksoft can produce such good software, but this is a very poor implementation of an excellent idea.

Steve Turnbull

FINGERTIP COMMUNICATION

DIALUP is a communications package which puts the world of information literally at your fingertips. It's vast range of 'up-to-the-minute' features must surely make it the most comprehensive 'value for money' communications package available to date.

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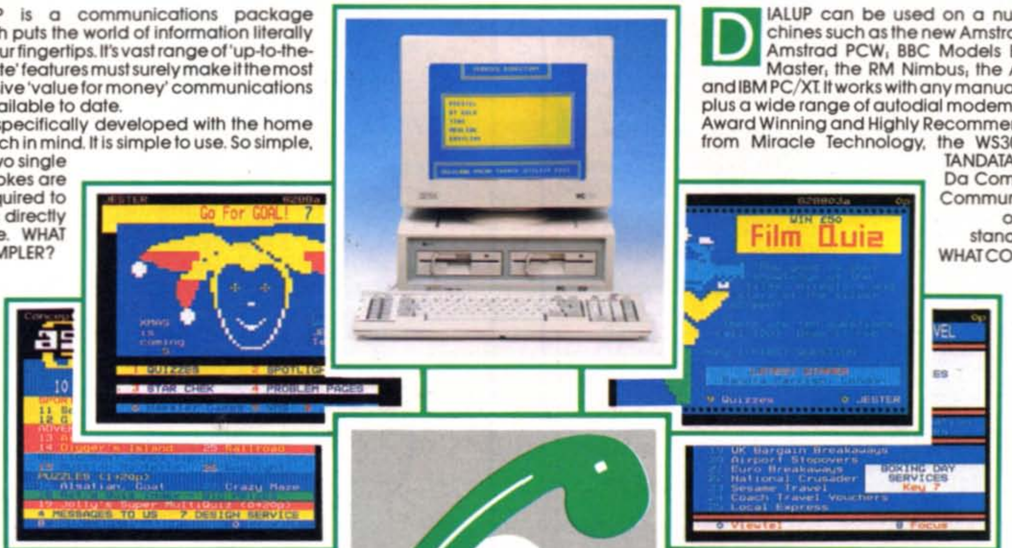
Go For GOAL!
1 QUIZZES
2 SPOTLIG
3 STAR CHEK
4 PROBLEM PAGES
14 Digger's Island
25 Railroad
PUZZLES (1+20p)
Alsatian, Goat
Crazy Maze
19 Jolly's Super MultiQuiz (a+20p)
4 MESSAGES TO US
7 DESIGN SERVICE
WIN £50
Film Quiz
9 Quizzes
0 JESTER
UK Bargain Breakaways
Airport Stopovers
Euro Breakaways
National Crusader
Sesame Travel
Coach Travel Vouchers
Local Express
BOXING DAY SERVICES
Key 7
0 Viewtel
8 Focus

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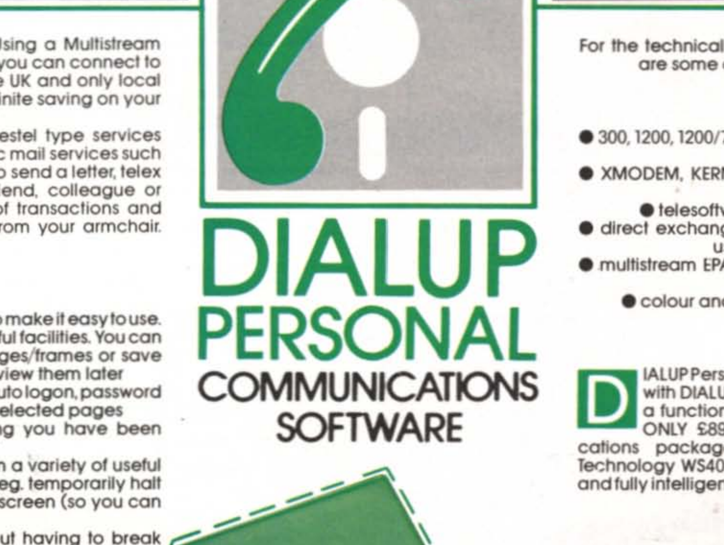
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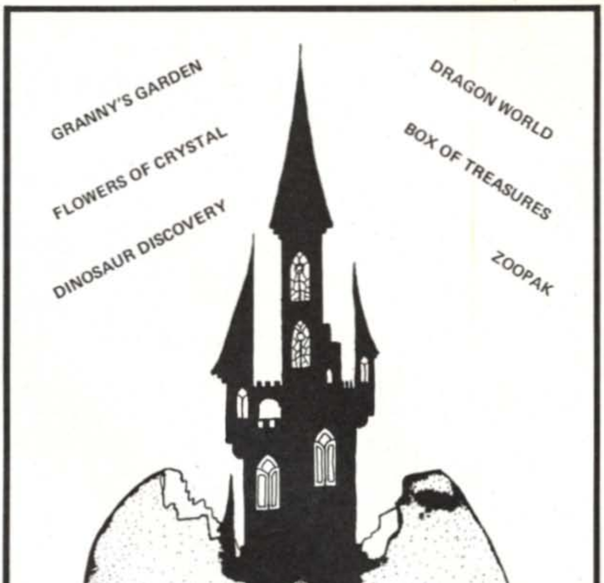

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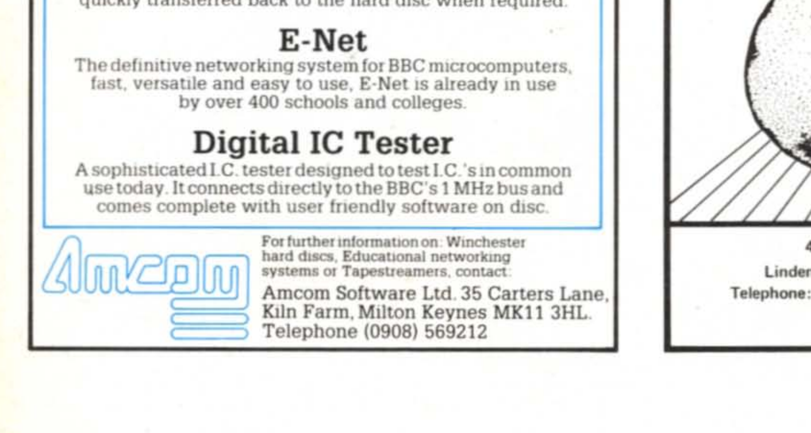
NEW TANKS!



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Available from: Design People Software, 77 Grimwade Street, Ipswich, Suffolk IP4 1LN, or from good distributors.

EDUCATION LETTERS

Keep your letters coming in – the education pages are here to reflect your interests. We want to hear your tips, ideas, experiences and suggestions. Send your contributions to:

Peter Davidson, Education Editor, The Micro User, Europa House, 68 Chester Road, Hazel Grove, Stockport, SK7 5NY.

Quality of display

IT IS interesting to reflect that only a short time ago, the person who painfully pecked at a typewriter keyboard with just two fingers would never have considered calling himself a typist.

It was easy to recognise the amateur because errors and overtypes were numerous, and somehow the way the whole piece of work was set out on the page instantly revealed the lack of knowledge, expertise and formal training which is normally the hallmark of a competent typist.

However, with the advent of the micro, more and more people are eager to use the keyboard and it has become commonplace to see them carefully picking their way over the keyboard using the hunt and peck technique of the two fingered typist.

Additionally, as software becomes more generally available, there is a growing awareness of the advantages of being able to type and to use the functions of a word processor.

More recently, word processing has been suggested to be a great educational aid to all kinds of users across the whole curriculum, via Special Needs, English, Humanities and Computer Studies Departments.

And it has been greeted with a great wave of enthusiasm by pupils and teachers, as well as the public at large.

The result has been reflected in the number of classrooms which now have walls adorned with examples of pupils' work which has been created using word processors.

These may initially appear to be very accurate – spellings may well have been pointed out and corrected, paragraphs drafted and redrafted to the eventual satisfaction of both pupil and teacher.

But on closer scrutiny it could be suggested that much of the work lacks any quality of display – and looks very much like the work produced by what were previously considered to be the very poor typists.

Yet pupils and teachers alike seem to be convinced that because they have mastered all the machine's functions they have become experts – or at the very least experienced word processing operators and teachers.

May I ask how this can possibly be acceptable?

Especially considering the very high standards set for even elementary word processing in the Business Studies areas by such examining bodies as The Royal Society of Arts.

For example, students must demonstrate an ability to key in, follow instructions, recall, edit and add text, follow correction signs and proof read their work to an acceptable standard of 99 per cent accuracy.

Also, all work must be displayed and presented to what is an RSA Stage I Typewriting examination standard, again to 99 per cent accuracy.

Additionally, there is a criterion for assessment in the completion of four tasks within a set timescale. And a requirement for assessment in a wide range of word processing functions. To be awarded a Certificate, the student must pass in all four areas unaided.

In view of these considerations it could be suggested that the next step in word processing is to ensure that text produced isn't simply displayed so that it looks more aesthetically pleasing and professional.

Some standardisation should be adopted by teachers all over the country so that all work produced conforms to a basic layout requirement which is recognisable and acceptable in a working environment.

This would no doubt require some cooperation, organisation and effort on the part of all teachers, plus a willingness to recognise that something must be done soon.

This could perhaps be achieved if Inset trainers with any involvement at all were actually qualified Typists/Word Processing Teachers themselves, instead of self-taught enthusiasts. Has anybody else got any views on this please? – **Doreen Goldstone, Danbury, Essex.**

Exit from slimmer

AS A teacher writing programs for primary school pupils, I have found Robin Nixon's character slimmer program in the May 1986 issue of The Micro User *most useful, as Mode 2 text is generally inappropriate for programs for this age group.*

For the convenience of other teachers, and the children, I usually arrange for programs to be CHAINed from a central menu program.

As not all of my programs are written in Mode 2, I should like to know of a routine to disable the character slimmer utility and return the micro to normal text. This would prevent the text from being corrupted in other modes as is currently the case.

Thank you for a most interesting and informative magazine – many of your articles have prompted ideas for further programs! – **Pauline Harris, Chelmsford, Essex.**

● You can return your micro to normal text as you change mode by following the mode change with *FX20.

Diagnosis at a distance

I AM a headmaster of a very small school with 50 pupils and I am looking for an easy-to-handle database program to use as an electronic card system.

I have a Master 128 and purchased Viewstore, but I find it much too difficult to handle. I want to be able to create my own cards, change them, print them out and so on. A sorting and searching procedure is also necessary.

I hope you can recommend a database that is not too complicated and yet flexible enough for me to handle.

*Also, I have another problem concerning the computer. As you know on the Master it's possible to have the time and date constantly available but sometimes I get a lot of garbage when I ask for the time using *TIME.*

*The clock then is completely lost and I have to put it right again using *PANEL. I asked my dealer but the only answer he could give was to show him the computer, which I'm afraid is very difficult for me as I live about a hundred miles away from him.*

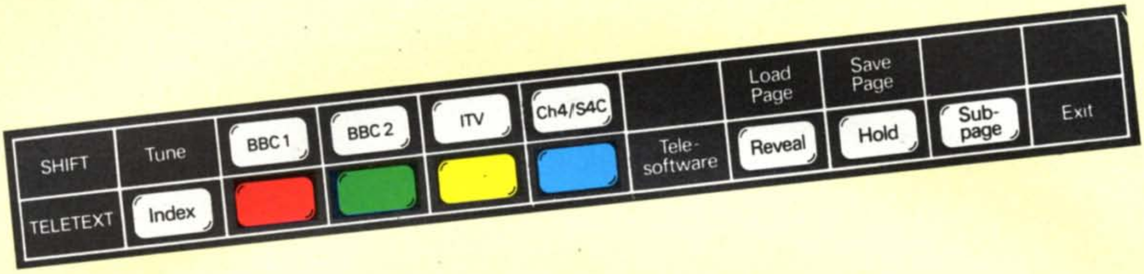
There are very few dealers because Acorn computers are not used very much over here and he is the nearest one I can get to.

I find your magazine very helpful as it's the only source of information I've got. – **J.M.M. Kok, Nederland.**

● For your requirement, Mini Office II seems to be the ideal package. Not only will the database cater for the points you raise, but the package would also give you many other features that could be of use in your school, such as mail-merging, label printing and graphics.

With regards to your other problem, as your dealer says it is very difficult to diagnose faults without first seeing the computer.

However, the way to find faults is a process of elimination and you could try first removing Viewstore, which from your letter appears to be the only non-standard part in your Master.



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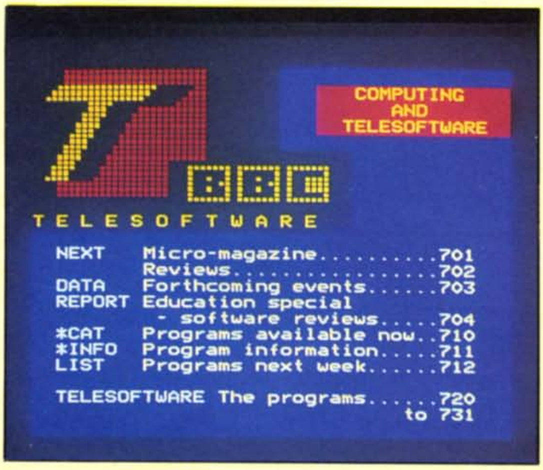

COMPUTING AND TELESOFTWARE

TELESOFTWARE

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        Reviews.................702
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Throughout Britain, 3½ million households regularly watch teletext – the many thousands of pages put out by Ceefax and Oracle covering everything from share prices to football results.

But if you have a BBC Micro you can do much more than just flash from page to page. With the BBC Teletext Adapter and rom – and using a normal TV set or monitor – you can store the pages in memory, transfer them to tape or disc, and display them again and again in any order you like.

BBC Micro Teletext System*
Includes Adapter, Rom, manual and guide to teletext

£69.95

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Includes Adapter, Advanced Teletext Rom, manual and guide to teletext

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**Not compatible with the BBC Compact*

BBC Advanced Teletext Rom
For existing users who wish to upgrade to the new Rom software

£7.95

All prices include VAT & P&P

For an extra £5 we will send you the BBC Advanced Teletext software – the only package providing ALL the features offered by the BBC/ITV services. Its many enhancements include automatic loading of associated pages each time you select a page from the menu – considerably speeding up access time.

There may be some pages you wish to look at regularly, such as news, sports results or weather. The latest teletext rom can be programmed to "keep" such pages for you, updating them as necessary. They can be displayed at the touch of a key, without waiting for them to come round.

- *If you already have the BBC Teletext System we will send you the new rom for £7.95.*

IMPORTANT: *The BBC point out that the Teletext Adapter, like a TV set, will not work satisfactorily without a good outside aerial. Nor will it funtion correctly if you experience interference such as ghosting.*
They emphasise that these problems only affect a few areas of the country. However, if you have any doubts as to the quality of signal available in your area you should contact the BBC Technical Support Service on 01-927 5040.

TO ORDER TURN TO THE FORM ON PAGE 159

OPUS WILL MAKE YOU A BETTER ORGANISER FOR ONLY £60

If your micro system is starting to get out of hand a smart organiser could be the solution to your problems.

At just £59.95 the Organiser desk from Opus Supplies will help to organise your system beautifully. It's purpose built to provide plenty of storage space and because it's produced alongside our range of executive computer desking it offers a level of quality you'll appreciate.

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All Master Compact Microcomputers are supplied complete with an integral 3½" Disc Drive and various educational and professional bundled softwares.

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Gemini's OFFICE MATE & OFFICE MASTER packages on Disc consisting of: Database, Spreadsheet, Beebplot graphics. Accounts packs: Cashbook, Final Accounts, Mailist, Easyledger, Invoice & Statements, Stock Control and Computer Concepts' popular Interword wordprocessor ROM; WHEN YOU BUY YOUR BBC MASTER COMPUTER FROM US.

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CO-PRO ADAPTOR

Now for the first time you can add the Master Co-processor boards, to your standard BBC model B, or B+. With this brand new launch from Watford Electronics. You can attach any BBC Master Co-processor to the original BBC Micro. Once again Watford forges ahead with a new concept in BBC micro addons. This unique external CO-PRO ADAPTOR, is protected by patent applications.
Use the super fast Turbo Board with your BBC B, it is much faster than the 6502 2nd processor it supercedes.
With the 512K addon your standard BBC machine achieves IBM PC compatibility at a realistic price running GEM, Lotus 123 and many other programs.
To use this addon you require a BBC model B, fitted with DNFS 1.20 or BBC B+ fitted with 1770 DFS 2.20 or greater. Co-processors work exactly as if they were second processors. Master owners may use this interface to add a second Co-processor.
Watford, brings power to your BBC at only:

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By popular demand our retail shop is now open until 8.00pm. every Thursday.

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● EPSON FX800 Printer	£315
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● EPSON Paper Roll Holder	£17
● EPSON LX86 Printer	£199
● EPSON LX80/86 Tractor Feed	£20
● EPSON LX80/86 Sheet Feeder	£49
● EPSON FX800 Printer	£315
● EPSON FX1000 Printer	£425
● EPSON EX800 Printer	£405
● EPSON LQ800 Printer	£449
● Brother HR20 Daisy Wheel	£329
● Centronics Printer Cable to interface all the above Printers to BBC	£6

(Securicor carriage charge on printers £7)

RX & FX PRINTER INTERFACES

Epson interfaces fit inside the printer to allow connection using techniques other than Centronics.

RS232	£27	RS232 + 2K Buffer	£55
IEEE 488	£65	RS232 & 8K Buffer	£75

CENTRONICS GLP & Brother M1009 (NLQ) Printers

A major price break-through in NLQ Printers from Watford.

At last, a low cost full feature printer,supplied complete with Watford's own NLQ ROM (separately at no extra cost). Due to Watford's bulk purchasing power and low margins we can now offer this incredible printer deal direct from the manufacturers to our customers.

Features include, Epson RX Compatible commands, Near Letter Quality print, 50 CPS Draft mode, Centronics parallel interface, Single, Double & Quadruple density graphics modes, Subscript & Superscript, handle up to 9½" wide standard paper, Friction Feed standard, Low cost Tractor feed optional extra, Bi-directional logic seeking.

Special Offer ***£95*** *(carr £5)*
Tractor Feed Attachment ***£12***

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(Ideal for School environment)

Connect 3 BBC Micros to 1 Printer	£60
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PRINTER CHANGER	
Connects 3 Printers to 1 Micro	£65

(Cables extra)

Acorn-Olivetti JP101 Spark Jet Printer

One of the main problems with most printers is that they are hopelessly noisy. How often have you wanted to print something late at night but not done so for fear of waking the children? Also ideal for those working in quiet environments such as libraries, etc. Silence the complaints with the serious solution from Watford at the amazing cost of only **£59**

Accepts standard 9½" Paper.

Pack of 4 refills **£10**

JP101 accepts 9½" standard fan fold paper or single A4 sheets. Tractor & Friction feed supplied as standard – print speed 50 cps.

RS232 Kit for the COMPACT
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EPROMs for BBC's Sideways ROMs.

2764-250nS £2.50
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RAMs (Low power) for ATPL, WATFORD, etc., Sideways ROM Boards

6264LP (8K) £2.90
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(IBM/Epson compatible)

KAGA KP815 Printer
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Only £369 (carr £7)

PRINTER LEADS

Centronics lead to connect BBC micro to EPSON, KAGA, SEIKOSHA, NEC, STAR, JUKI, BROTHER, SHINWA etc. printers.

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RX80	£4.50	£4.50
LX80	£4.00	£4.50
GP80	£4.50	£4.00
GP100-GP250	£5.95	£3.95
Centronics GLP	£4.00	£3.75
KAGA KP810	£5.25	£4.75
CANON PW1080	£5.25	£4.75
Panasonic KX1080	£7.75	£4.75
Microvitec Metal Monitors	–	£5.50

Our attractive Dust Covers are manufactured from translucent PVC. The seams are stitched and edges are taped to prevent splitting due to continuous use.

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Teleprinter Roll (Econo paper)	£4

Carriage on 1,000 Sheets £1.50

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(On continuous fanfold backing sheet)

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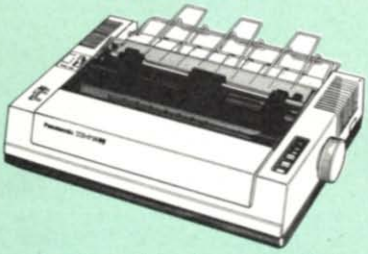
1,000 90 × 49mm (Twin Row)	£7.50
1,000 102 × 36mm (Twin Row)	£6.25

Carriage on 1,000 Labels £1.00

Panasonic KX-P1080



from the prodigious Japanese Stable of Panasonic comes this fabulous new NLQ Dot Matrix Printer

Available NOW at a superbly realistic price, the KX-P1080 perfectly balances features, quality of construction and Value for Money to produce the printer of tomorrow, here today, ready to sweep the current generation of machines away.

Ingenious innovation in terms of software control codes permits great flexibility when it comes to defining the print style. A nippy 100 cps of clear Draft text backs up the crisp 20 cps Near Letter Quality text mode, with upto 40 superbly useful downloadable characters. A delightful range of assorted character widths is efficiently supported, with sizes ranging from a broad 5 cpi to petite 17 cpi, EVEN in NLQ mode. Some of the extensive support for serious use includes specialised functions to perform justification, centering and even left and right ranging. Proportional spacing permit even greater freedom when it comes to advanced use. Not only is the full Epson RX compatible control code set implemented, but extra codes have also been added to cater for the NLQ options, etc.

A full 96 ASCII character set is supported, with an extended set of 32 international characters A 1K Print Buffer alleviates much of the wait time normally associated with printing, whilst the bi-directional logic seeking print head takes the quickest route to print as required.

The draft text is implemented with a 9 × 9 matrix, with Near Letter Quality effected by means of an 18 × 18 matrix.

(Price inludes, FREE A 4ft Printer Lead, and a Dump Out 3, Screen Dump ROM worth £35 with every printer purchased from us).

Special Price: **£149** (carr. £7)

Panasonic RS232 Interface: **£39**

Panasonic KX-P1092 Dot Matrix Printer

Similar to KX-P1080 but has 180cps speed, Draft and NLQ down loadable characters option and is IBM/Epson compatible.

Price £345

Panasonic KX-P3131 Daisy-Wheel Printer

A few months ago, we introduced the KX-P1080 to our large and discerning customer base. As a result of the enthusiastic and overwhelming reaction to this versatile dot matrix printer (see above for details), we are now extremely pleased to be able to bring you details of the fabulous KX-P3131 Daisywheel Printer, also from Panasonic. The KX-P3131 printer is the ideal printer for the home user wishing to produce clear, immaculate letters or reports.

Ideally suited to the pocket of the home user, costing not much more than a pair of disc drives, this daisywheel printer delivers flawless text at 10, 12 or 15 characters per inch. It also supports proportional print mode.

Printing at a respectable 17 characters per second, the KX-P3131 features a capacious 6 kilobytes printer buffer to swallow most printing requirements with ease. For the more demanding user, there is a 32 kilobytes printer buffer option available. Taking paper up to 13.5" wide, the KX-P3131 prints with bidirectional logic seeking, ensuring the minumum time to print your text.

Only **£218** (carr. £7)

Single Sheet Feeder	**£195**
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We stock a range of monitors to suit all needs. Choice of a monitor is a matter of personal taste so we recommend that whenever possible, you ask for a demonstration at our shop. All Monitors are supplied complete with connecting lead.

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● KAGA KX1202G Long persistence Hi-Res Green Monitor	**£93**
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● **Kaga Super Vision 3,** Ultra Hi-res, RGB Colour) Text mode switch allows monochrome text display in Green, Amber, White reverse or White on Blue	**£309**
● 12" Anti-Glare Screens	**£9.50**

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● Hi res Colour Monitor	**£219**

ZENITH

"Test Bureau Recommended for use in Education"

12" high resolution monochrome monitor. Ideal for word processing as its green or amber screen is very restful to read. (These are the same professional quality, stylishly finished monitors as used in the larger Zenith PC Systems.)

Green (New Design) Hi-res	**£69**
Amber (New Design) Hi-res	**£74**

LEADS

BNC Lead for Zenith or Philips	**£3**
Skart Monitor Lead	**£5**
RGB lead for KAGA	**£3**

N.B. carriage on Monitors **£7** (securicor)

SWIVEL BASES

for Video Monitors

By placing your monitor on one of our superb swivel bases, you gain the freedom to adjust the monitor viewing angle to suit your needs. By doing this, you alleviate eye strain and reduce back stress.

for 12" Monitors **£10** (carr. £2.50)
for 14" Monitors **£14** (carr. £2.50)

INCREDIBLE WORD PROCESSING DEAL ! ! !

Watford Electronics, already renowned for quality products at discount prices, are offering, the truly spectacular BARGAIN OF THE YEAR!

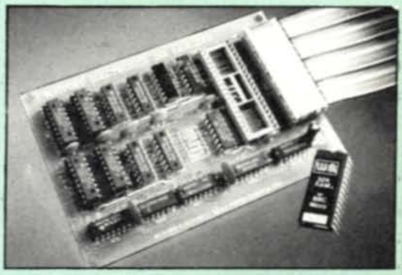
A Watford's 32K Shadow RAM Card – Printer Buffer and the much sought after, Computer Concepts' Inter-WORD, (a very powerful package) All this at an astounding price of:

Only £89 (carr £2)

32K

SHADOW RAM-Printer Buffer

Expansion Board



A MUST FOR WORD PROCESSING

Watford Electronics now brings you the latest state-of-the-art MEMORY EXPANSION BOARD for your BBC microcomputer. Don't throw away your BBC B for a BBC B Plus or BBC Master. Just plug the ribbon cable into the 6502 processor socket, and fit the compact board inside the computer. Immediately you will gain not 16K or even 20K, but a massive 32K of extra RAM!!!

● IMPROVE your WORD PROCESSING system, whether disc or cassette based. Don't wait for a slow printer – type in text while printing. TWO JOBS DONE SIMULTANEOUSLY and £100+ saved on a printer buffer.

● "VIEW" Wordprocessor users can now type in letters in 80 columns and have up to 28,000 bytes free – 5 times as much as normal.

● In WORDWISE (or WORDWISE-PLUS), preview in 80 columns with the full 24K of text in memory. This product is recommended as an ideal complement by Computer Concepts.

● Combine GOOD GRAPHICS and LONG PROGRAMS. Use the top 20K of the expansion RAM as the screen display memory, leaving all the standard BBC RAM free for programs. Benefit from MODE 0/1/2 graphics and 28K of program space.

● Use the FULL 32K or the bottom 12K of the expansion RAM as a PRINTER buffer for PARALLEL or SERIAL printers, sound channels, RS423 etc. Print large text files while running long graphics programs, and have all your buffer options available as well (*FX15,21,138,145,ADVAL etc). Please note only a 12K printer buffer can be used with Wordwise or Wordwise-Plus, due to the way they are written.

● Ensure COMPATIBILITY with a vast range of hardware (including our ROM board, the ATPL ROM boards, double density boards, second processors), and software (including BASIC, TOOLKIT, VIEW, WORDWISE (1.20+), WORDWISE-PLUS, Music 500's AMPLE). This is because our board, unlike those of our competitors, is connected to the computer by a ribbon cable and has the power consumption of a couple of ROMs!

● Achieve EASY OPERATION with ROM based software. A large range of commands is available for machine code and BASIC users, including some useful *HELP messages, and a comprehensive manual is supplied free.

● Unique facility to turn ROMs off and on again. Unlike all other ROM managers, this feature does not use 'unofficial' memory. Two bytes of normally user-inaccessible memory on the RAM card are used to ensure ROMs are disabled WHERE OTHER ROMS FAIL.

Only £59 (carr £2)

(Price includes a comprehensive manual and the ROM)

Continued →

Mark II Light Pen

You no longer have to fiddle with the brilliance control or work in the shade as this NEW Mark II Light Pen is totally insensitive to local lighting conditions. It only operates on high frequency light from the TV or Monitor. The red LED Indicator on the Mk II pen, lights up when valid video data is available. Your program can have access to this signal allowing computer verification of target for high res drawing. The conveniently located switch on the pen body allows the computer to ignore any stray signals. Supplied complete with the sophisticated PEN-PAL Software on Cassette or Disc. Please specify.

Special Offer Price: £15

THE EPSON RX-FX-KAGA PRINTER COMMANDS REVEALED (BOOK)

So you bought yourself a new printer, because the salesman in the shop showed you how clever it is and impressed you with all sorts of printouts to show its capabilities – he may even have offered you a special price.

However, now that you have got it home and connected it to your BBC microcomputer, you are wondering how to make it perform these magical tasks. The manual seems to give no clues, and when you type in the example programs, the computer throws the LPRINT statements back in your face.

Now what do you do, when this £400 piece of high technology refuses even to move its head, and you have stayed up until 2 in the morning with copious supplies of coffee, desperately trying to print something out. Once again, Watford Electronics comes to your help with our new book entitled 'THE EPSON FX-KAGA PRINTER COMMANDS REVEALED'.

This book describes in plain, easy to understand English, how to use and make the most of your KP810, Canon PW1080A or any Epson FX80 compatible Printer with the BBC Micro, both from Basic and Wordwise.

It describes in detail how to obtain the maximum in graphics capability from your printer and includes full indexes allowing you to cross index the numerous commands. Every command is explained in detail, with an accompanying BBC Basic program and an example of its use from Wordwise.

Superb Value at **£5.95** (No VAT)

NOW WITH EXTRA FEATURES AT NO EXTRA COST
Watford's latest DFS 1.44

- Incorporates Acorn's Official Tube Host Code so that those with 2nd processors no longer need to waste a ROM socket on the DNFS.
- Option to DOUBLE the speed of BPUT and BGET.

If you already have the Watford Electronics DFS and wish to incorporate these new facilities ten simply return your existing DFS ROM to us together with £5 remittance for an upgrade. Please pack the ROM securely and address the package to our Upgrades Dept.

WATFORD's & ACORN's SINGLE DENSITY DFS

Watford's popular and widely acclaimed DFS has now been available for four years, and has gained a large following amongst serious users of the BBC Micro. Owners of Acorn or any other standard DFS can upgrade to our "Ultimate" DFS merely by replacing their DFS ROM. See below for this upgrade. ***(P.S. Watford's highly sophisticated DFS is fully compatible with Acorn DFS).***

PRICES

- *Complete Disc Interface Kit including DFS ROM and fitting instructions* **£62**
- *Acorn's 0.90 DFS Kit complete* **£57**
- *DFS Manual (Comprehensive)* *(no VAT)* **£6.95** *(P.S. Our comprehensive DFS Manual covers both Acorn & Watford DFSs).*
- *Watford's sophisticated DFS ROM only* **£16**
- *We will exchange your existing DFS ROM for Watford's Ultimate DFS ROM for only* **£12**
- *DNFS ROM only* **£17**
- *ADFS ROM only* **£25**
- *Watford's DFS is exclusively available from Watford Electronics and their appointed dealers only. Every ROM carries a special label with LOGO and serial number.*

WATFORD's DOUBLE DENSITY DFS INTERFACE

The DDFS from Watford Electronics represents a new standard in DFSs for the BBC micro. This is a double density version of our popular single density DFS, and combines all the features of this powerful DFS with the advantages of a system that gives 80% more storage per disc in double density mode. P.S. – Please note that not all DDFSs are capable of providing either the full 80% storage increase, or of allowing a file the full size of the disc – Ours allows both of these! Operates both in Single & Double Density modes.

The typical piece of games software these days is provided upon a protected disc. In order to work on any double density system (including the others on the market) a protected piece of software needs to make calls through the OSWORD &7F routines. To ensure compatibility, the Watford DDFS features probably the most comprehensive and powerful 8271 emulation ever written for a double density system.

PRICES

- *Complete DDFS Kit incl. fitting instructions* **£46**
- *DDFS Manual* *(no VAT)* **£6.95**
- *We will exchange your existing Single Density DFS Kit for our DDFS Unit at* **£29**

BBC MICRO BUSINESS/ WORD/PROCESSING PACKAGE

A complete word-processing package (which can be heavily modified to your requirements, maintaining the large discount). Please telephone or call in at our retail shop to discuss your particular requirement and a demonstration.

EXAMPLE PACKAGE

BBC Master 128K Micro, View wordprocessor, Viewsheet, Basic Editor, Terminal Emulator, Twin 800K 40-80 track double sided Disc Drives, Zenith Hi-Res green monitor, Panasonic KX-P3131 professional quality Daisy Wheel printer, Gemini Database, Spreadsheet, Beebplot Graphics, Cashbook, Final Accounts, Mailist, Easiledger, Invoice & Statements, and Stock Control packages on disc with manuals.

Only £899

A Low Cost wordprocessing package: Same as above except, a single disc drive instead of a twin and Olivetti Spark Jet Printer instead of Panasonic.

Only £625

MYSTERIES OF DISC DRIVES & DFS REVEALED (BOOK)

Are you tired of faulty cassettes, and lengthy loading times? Do you want to upgrade your BBC micro to take discs but you get tied up in the plethora of jargon surrounding the choice and use of these systems.

For instance, what is the difference between single and double density formats, how can you use a 40 track disc on an 80 track disc drive[What is the difference between a DFS and disc interface kit? Should you acquire a single Disc drive or twin[What does 48 TPI and 96 TPI discs mean? These are just a few of the questions you may have asked yourself and never found the answer or maybe you have yet to encounter these questions.

Now the mystery of buying a suitable interface and disc drive for your BBC micro is revealed in Watford's new book entitled 'MYSTERIES OF DISC DRIVES & DFS REVEALED'. It describes in fine detail, yet remaining very readable to the beginner, how disc drives operate, the type of interfaces available, which type of discs to use on a disc drive and how data is stored on the discs.

£5.95 (Book No VAT)

DISC ALBUMS

Attractively finished in antique brown leather look vinyl. Stores upto 20 Discs. Each disc can be seen through the clear view pocket.

£4

EXTENDED WARRANTY

Now Available
For BBC, Masters, Disc Drives & Monitors.
Write or phone for further details

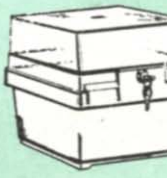
FLOPPY HEAD CLEANER KIT

The heads in floppy drives are precision made and very sensitive to dirt. The use of a cleaner Kit is a sensible precaution against losing valuable data. It is recommended to clean the drive head once a week. It is very simple to use.

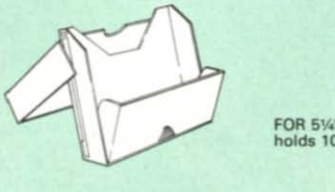
£8

ANTISTATIC LOCKABLE DISC STORAGE UNITS

Gives double protection – Strong plastic case that affords real protection to your discs. Antistatic helps avoid data corruption whilst in storage. The smoked top locks down. Dividers and adhesive title strips are supplied for efficient filing of discs.



- M35 - holds upto 50 discs **£8**
- M85 – holds upto 95 discs **£10**



PLASTIC LIBRARY CASES

FOR 5¼" DISC STORAGE holds 10 Discs. **£2.00**

DUST COVERS (For our Disc Drives)

Single CLS (without PSU) **£3.20** Twin CLD (without PSU) **£3.85**
Single CS (with PSU) **£3.95** Twin CD (with PSU) **£3.90**

Quality Disc Drives from Watford

To help you decide which drive is the most suitable for your needs (and your pocket!), we have produced the table below.

The first capacity given in the first column indicates capacity in single density mode. That within the brackets is the capacity in double density mode. All disc drive type numbers start with the prefix "C".

The tinting on some of the boxes is used to indicate which Drives are 40 track (non-tinted) and which are 80 track (tinted). All our drives are of Japanese manufacture. All our 80 track drives are already fitted with a 40-80 select switch.

***All our Disc Drives are Double Sided and will operate in both Single and Double Density modes.** Extensive experience of the usage of disc drives suggests that the JAPANESE drives currently represent about the best in terms of speed, reliability and overall "elegance" available for the BBC Micro.*

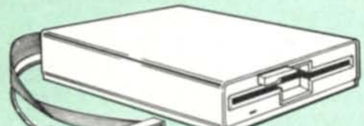
Various other "manufacturers" of disc drives for the BBC micro (more accurately, "packages" label other manufacturers drives with their own name). We buy the high quality JVC and Mitsubishi drives in large quantities directly from the manufacturers, package them and sell them at "dealer" prices direct to the public.

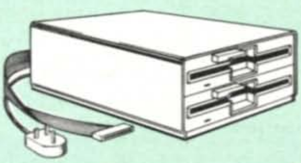
If you look around the popular BBC micro press, you will find that the prices we quote for the top quality, new slimline disc drives are, virtually without exception, some of the best around. These prices, coupled with the backup of one of the country's largest distributors of BBC peripherals provides a superb deal.

Unless you anticipate using dual drives in a fully expanded BBC system for long periods of time with little ventilation, then we suggest that our range of "CL" disc drives without the PSU (Power Supply Unit) would be quite adequate (extensive tests within our workshops have confirmed this). All drives are supplied complete with a SPECIAL UTILITIES Disc, Cables and Plugs. The Drives with power supply have a mains moulded plug for safety purposes. Ideal for Schools & Colleges. We are now able to supply all single disc drives with Power Supply, in either single or dual case. (Dual case has a twin data cable and a power supply capable of driving two disc drives) allows easy expansion to a dual drive unit, at a later date. Prices stated in the pricing boxes below for single drives is for a single drive in a standard single case. Single drive in a dual case cost an extra £5. (At Watford we anticipate your needs of tomorrow, not just today)!

When using a BBC Micro, most people find themselves short of desk space. The Watford's BBC Micro plinths form an ideal way of recovering some of this precious space) your BBC, Disc Drive and Monitor can all occupy the same vertical footprint and still be comfortably situated. With the Watford Double plinth, your Disc Drive is mounted vertically at one side, leaving a very valuable area directly in front of you for such useful items as spare discs, pen, paper, reference manuals, etc. Follow the trend with Watford plinth. (Turn to the 10th page of our advert for the Plinths).
P.S. All our 5¼" Disc Drives are compatible with the Compact Micro. All you require is the special Compact Disc Drive Cables designed by us.

Cable to connect 5¼" Disc Drives to BBC Compact
Single £9 Twin £12
Special Cable to connect 3½" and 5¼" Disc Drive to BBC Compact £13





Capacity	Drives without P.S.U.		Drives with P.S.U.	
	Single	Twin	Single	Twin
200K (360K)	CLS 200 £95		CS 200 £108	
400K (720K)	CLS400S £96	CLD 400 £180	CS 400S £109	CD400 £200
800K (1.44M)		CLD 800S £183		CD 800S £204

- TWIN Disc Drive Case, complete with Power Supply & Cables **£43**

Securicor carriage on Disc Drives £5 to £6

Prefix ***C*** *= Cased Drive*	*Suffix* ***S*** *= 40-80 Switchable*
L *= Less PSU*	
S *= Single*	
D *= Double*	

e.g. CLS400S = Cased drive, Less power supply unit, Single 400K, Switchable (40-80 track).

3M – DISKETTES

Top quality 3M – SCOTCH Diskettes from Watford Electronics (Your 3M Appointed Distributors). All our discs carry a lifetime warranty. These discs are quiet in operation and insert positively with their reinforced hub rings. Boxes of 10 supplied complete with self stick disc labels and write protect tabs.

● *10 × 5¼" S/S D/D 40 Track Diskettes*	***£10***
● *10 × 5¼" D/S D/D 40 Track Diskettes*	***£12***
● *10 × 5¼" S/S D/D 80 Track Diskettes*	***£15***
● *10 × 5¼" D/S D/D 80 Track Diskettes*	***£15***
● *Hi-Density 10 × 5¼" 1.6M D/S D/D for IBM*	***£32***
● *10 × 3½" S/S D/D 40/80 track Discs*	***£20***
● *10 × 3½" D/D D/D 40/80 track Discs*	***£24***

TOP QUALITY 3½" & 5¼" DISKETTES

To complement the range of quality discs and disc drives that WE already sell, WE are now supplying some special offer packs of 10 high quality discs. Each Disc has a reinforced hub ring and carries a lifetime guarantee. These are supplied complete with selfstick labels and packaged in an attractive plastic library disc box to protect them from damage. We strongly recommend these Discs.

DON'T SETTLE FOR LESS, BUY THE BEST

● *10 ×* ***M3*** *3½" D/S D/D 80 Track Discs*	***£20***
● *10 ×* ***M4*** *5¼" S/S D/D 40 Track Discs*	***£9***
● *10 ×* ***M5*** *5¼" D/S D/D 40 Track Discs*	***£11***
● *10 ×* ***M7*** *5¼" D/S D/D 80 Track Discs*	***£14***
● *3" Double Sided Discs*	***£3*** *each*

Special BULK OFFER on 5¼" DISCS

(Supplied packed in plastic storage Units)
(Lifetime warranty on Discs)

BULK PACK DISCS in lots of 100

Type	S-S 40T	D-S 40T	D-S 80T
● Without Sleeves	£46	£49	£72
● With Sleeves	£49	£52	£75

ACORN WINCHESTER DRIVES

Suitable for direct connection, via the 1MHz bus, to any BBC running ADFS. These Acorn Winchester disc drives are fast and extremely reliable. Each Winchester comes complete with the Level III Econet File Server software.

10 Megabytes **£1050; 30 Megabytes £1549**

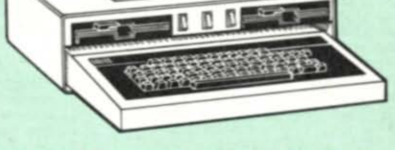
WATFORD's WINCHESTER DRIVES

● 20 Megabytes with ADFS	**£635**
● 40 Megabytes with ADFS	**£999**

WINCHESTER WORKSTATION

20 Megabyte Winchester, plus a Tape Streamer and a 400K Floppy Drive all housed in a plinth with cooling fan **£1499**

CDP 800S



CDPM 800S

Twin 800K Double sided 40-80 track switchable disc drives mounted in an attractively finished Beige colour plinth for the BBC Micro. Supplied complete with integral power supply, cables and Utilities disc. The switches are mounted on the front panel for ease of use.

CDP 800S for BBC Micro £210

CDPM 800S for Master £225
(Securicor Carr. £7)

ACORN's Special Twin 800K Disc Drives

Specially mounted side by side in a Master Plinth. Supplied complete with Manual and Cables. Plugs directly to the Master Computer.

RRP £250 **Our Price: Only £199** (carr £7)

EPSON NLQ ROM
for the BBC Micro

Harness the full potentials of your Epson RX & FX Printers. Impress your friends and business colleagues with the quality of your letters and printed material with Watford's very simple to use EPSON NLQ! (Near Letter Quality) ROM. Suitable for FX80, RX80, RX80F/T, FX100.

Look at the features:
- Simply type *NLQ80-100 and a single VDU code to use NLQ print.
- NLQ is then available without any modifications from BASIC, WORDWISE, VIEW (with NLQ DRIVER) or virtually any other program or language.
- Single codes select PROPORTIONAL type (yes even on the RX80) ENLARGED type; UNDERLINED type. These features can be used seperately or in any combination.
- Full UK character set) Standard 'pica size') Proportional spacing; Enlarged; Underlined; Normal type.

The NLQ ROM is supplied complete with comprehensive manual.

P.S. NLQ ROM is compatible with the Torch Z80 system and can be used from within the Perfect Writer software.

Only: £25

VIEW PRINTER DRIVER for NLQ ROM

This specially written printer driver has been designed to allow View access to the full features of our NLQ ROM.
A must for all VIEW and NLQ ROM users.

£7.00
(Hi-View compatible)

THE NLQ DESIGNER

(The First & still the Best)

KAGA KP810-910 and Canon PW1080 are two superb printers, as our many thousands of satisfied customers would surely attest to. One of it's particularly strong points is the NLQ option that it offers; perhaps one of the more weaker points is the effort required to design your own custom NLQ font.

Well the solution is here NOW in the shape of Watford's NLQ DESIGNER ROM! For the BBC Micro. This powerful piece of software allows easy design and entry of a full NLQ font, with further fonts recallable from disc. Once a font has been programmed with the versatile NLQ DESIGNER, it can be saved to disc, downloaded to your Kaga (or Canon) printer, or even programmed into an EPROM (given the appropriate hardware) and then plugged directly into your printer so that it is available immediately when you turn it on.
Downloadable Fonts require 6264 RAM chip fitted. Now BBC Master compatible.

A 40 or 80 track (please specify) FONT Disc containing 9 Fonts, (Italic, Courier, Courier Italic, Script, Copper Plate, Shadow, Bold, Double Print and Gothic is now supplied FREE with every package.

(P.S. This ROM is not suitable for Epson printers.)

- NLQ Designer ROM & FONT Disc **£25**
- Kaga Individual FONT ROMs **£15**

(Write in for further details).

DUMPOUT 3

A highly sophisticated screen dump ROM. This has to be the most flexible and powerful screen dump ROM yet produced for the BBC micro. It will put on paper anything you see on the screen, including all Mode 7 facilities etc. We have to admit that there is one facility that we cannot replicate – if anyone can supply flashing ink we would like to know!
The ROM also provides window setting utilities and two new OSWORD calls that allow mode 7 graphics pixels to be read and plotted using the standard graphic co-ordinate system. The latest version includes a graphic dump trigger for dumping screens from games whilst they are running.
Two commands are used to operate the dump routines(
*GIMAGE – This provides a full graphics dump of any graphics mode, plus modes 7 and '8'. There are many optional parameters but you need only specify the parameters you wish to change.

Features available include:

- Vertical and horizontal scaling through all the graphic modes and mode 7
- Rotation of the image produced through 90, 180 and 270 degrees
- Left hand indentation setting
- Screen dump window definition
- Colour grey scaling
- Two tone fast dump
- Special colour mask
- Mode 7 contrast expansion
- Mode 7 contiguous dump
- Key triggered dumps
- User port switched dumps

What does the independent press say!

Practical Electronics, May 1985
"The Dump Out 3 ROM from Watford Electronics represents one of the most sophisticated types of printer dump utilities available for the BBC Micro . . .".

"an extremely sophisticated and powerful dump utility".

"VERDICT – Dump Out 3 ROM has all the facilities which you are ever likely to need for producing printer dumps. The facilities available work extremely well and if printer dumps are something which you require, then this ROM can be recommended to help you to get the best out of your dot matrix printer".

The Micro User Feb. 1985.
"Well, here is that winner"!

"provides) some rather sophisticated screen dumps. Producing high resolution paper copies of graphic screens in any (graphics) mode will be the major reason for buying this ROM, and this is where Dump Out 3 performs PAR EXCELLENCE". (Our capitals for their italics.)

"The versatility of ßGIMAGE (the graphics dump command) when using these parameters is amazing. Pictures of almost any size, shape, contrast or distortion may be produced without the need for a reducing photocopier or trick photography".

"Without reservation I wholeheartedly recommend the Dump Out 3 ROM as the ultimate screen dump facility for the BBC micro. It is easy to use yet highly versatile, and caters for all BBC screen modes in multitone high resolution printing. Whole, partial, rotated and scaled screens may be dumped to almost any BBC compatible dot matrix printer (see our list at the end of this advert). At £25 it must represent excellent value for money and surely cannot be beaten".

Designed for use with the following printers:

GLP, GP80/100/250, CANNON, STAR, KAGA/TAXAN, NEC, SHINWA CP80, GEMINI, EPSON MX/RX/FX, M1009, NEC PC8023, DMP100/200/400, Panasonic KX1080, Mannesman Tally etc.

Price including comprehensive manual

£25

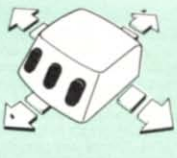
MEGABUFFER 256

This new Megabuffer 356 from Watford is a full featured 256K Printer Buffer. It allows the computer to print 256,000 character in a short time thus freeing the computer very quickly. In short it makes light work of printing large documents, screen dumps, etc. It is extremely simple to connect. The features are:
- Low Cost, High performance.
- Improves efficiency by making more efficient use of computer and printer.
- Compatible with any computer and printer that uses Centronics Parallel connections including all BBCs, IBM PCs, etc.
- Total compatibility with all software.
- Cheaper phone bills when using your Modems.
- Ideal for those doing large graphics screen dumps that are slow to print.
- Multi-Copy facility allows you to print several copies via Megabuffer without going through your computer.
- Data Dump facility is included.
- Built in test unit for both the buffer & your printer.

In conclusion it can safely be said that MEGABUFFER 256 is the ultimate printer Buffer for both the amateur and professional user.

Only £99 (carr £2)

THE AMX MOUSE



Now supplied with the NEW SUPERART Software ROM & Disc at no extra cost.

ONLY: **£63** (carr £1.50)

We are giving away, absolutely **FREE**, our popular Colour Art software package worth **£15** with every AMX Mouse package purchased from us.

AMX MOUSE ONLY	**£35**
AMX DESK Package	**£19.00**
AMX UTILITY Package	**£11.00**
AMX SUPERART Package	**£39**
AMX PAGE-MAKER Pack Best desk-top publishing software. Works with keyboard, joystick and AMX Mouse	**£32**

We are giving away, absolutely FREE, PAGE-FONTS, a disc containing over 20 fonts, with every purchase of AMX PAGE-MAKER from us.

PAGE-FONTS Over 20 fonts for use with AMX PAGE-MAKER	**£9.50**
AMX 3D ZICON Disc	**£19**
AMX Database Disc	**£19**
AMX XAM Educational	**£19**
AMX MAX(A gem of desktop (ROM)	**£17**

RB2 MARCONI TRACKER BALL

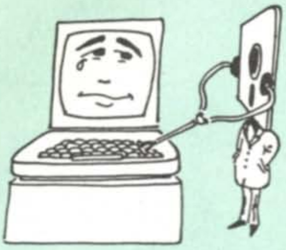
This popular unit is supplied complete with software.

Price: **£50**

FLEET STREET EDITOR

Software pack **£35**

DIAGNOSTICS DISC



The BBC micro is a very complex machine and thus diagnosing a fault can be very difficult. Until now, the only way to discover the nature of a fault was either to find a competent friend with a large degree of patience or to find your nearest dealer and pay him to find out what is wrong.

At Watford Electronics, we realise how difficult it can be when faced with a problem, finding yourself a long way from your nearest dealer, or even just uncertain about your Beeb's health, but not wanting to waste time and money taking it to be looked at.

The solution to these problems is here now, in the form of the Watford's Diagnostics Disc. This excellent utility is specially designed to test out the following areas of your Beeb:

RAMs, ROMs, ULAs, Sound, Keyboard, Disc, RS423, ADC, User Port, Printer Port, Cassette, Joysticks, Speech, Disc Drives, 6502 and Z80 2nd Processors.

This utility is an invaluable aid for all those who take the reliability of their system seriously. A comprehensive manual provides full operating details and a list of possible causes and remedies for any faults that you may find along the way. The package also enables a permanent equipment and service record to be maintained.

Only £20.00

BBC Publication's Popular Educational Software

● Maths with a Story 1 (Cassette). 4 primary level maths programs	£10.95
● Maths with a Story 2 (Cassette) 4 further maths programs	£10.95
● Picture Craft (Disc) 6 - 14 age group. Pack consists of flexible geometrical design & colouring programs	£19.95
● WAVES: Science Topics (Disc) CSC O Level Physics program.	£14.95
● RELATIONSHIP: Science (Disc) O Level Biology program.	£14.95
● BONDING: Science (Disc) O Level Chemistry program.	£14.95
● ELECTROMAGNETIC SPECTRUM (8 Discs) O Level program.	£14.95
● ELECTRONICS IN ACTION (Disc) O Level program	£14.95
● NEWTON & THE SPACE SHUTTLE (Disc) O Level program.	£20
● ECOLOGY (Disc) O Level program.	£20
● POLYMERS (Disc) O Level program.	£20
● Clasification & Periodic Table O Level. The suite is supplied with its own database of chemical elements which can be classified according to your own rule.	£20
● FOOD & POPULATION (Disc) O Level program.	£20
● MICROTECHNOLOGY (Cassette) O Level program.	£6.95
● A VOUS LA FRANCE (2 Cassettes) A French language home study aid.	£17
● DEUTSCH DIREKT! (Disc & Audio Cassette)	£20

TED

The Teletext Editor Package for serious users

TED is the brand new package from Watford Electronics for the editing and creation of teletext (Mode 7) screens and displays. TED is ideal for anyone wanting to create their own Mode 7 pictures (such as game title pages), designing animated displays for shop windows, exhibitions, classrooms, etc. TED is also probably the most powerful Prestel screen editor you will ever come across.

Supplied on a special 32k package, full facilities are providing for manipulating the screen, including easy to use pixel manipulation; line, column and block buffering and copying; left and right margins; large text in a variety of different fonts (contained within the ROM device); various borders and effects templates (contained within the ROM device); line and column insertion and deletion; easy to use graphics line drawing. Those are some of the features of editor itself. In addition to this, TED contains routines for taking a number of Teletext screens and creating them into an animated sequence, with user selectable display times, repeats on a group of shows, various entry methods (how the picture is put onto the screen), routing selection (both predefined and keyboard specific), chaining of other shows, etc. Scrolls treat the Teletext sequence as a very long page with a window onto it. Supplied complete with a comprehensive manual. There are many more facilities not mentioned here, so write in for a comprehensive leaflet; you'll wonder how you managed without TED.

Price: £35

ROM-SPELL

"way ahead of any competition"

ROMSPELL
ENGLISH DICTIONARY

ROM-SPELL is probably THE most advanced and fastest spelling checker available for the BBC Micro. Printed below are some extracts from a recent independent review (A&B Computing Nov. '85), which we feel sure will convince you that this is THE only spelling checker worth considering.

"The editing system is very neat and simple, instead of replying to queries and beeps all of the time . . ."

"The other feature which places ROM-SPELL way in front of any competition is the ability to examine the user dictionary, so any spelling mistakes that have found themselves on the disc can be examined and taken out if necessary".

". . . that it is compatible with many of the popular word processors on the market is a good indication that ROM-SPELL is going to be a very popular product indeed".

". . . ROM-SPELL is by far the best spelling checker for the unexpanded BBC B (with or without word processor). It boasts features which are hard to find on conventional spellcheckers on CP-M and MSDOS, namely Spellstar and has a speed-performance ratio of roughly the same as its CP/M cousin. The difference is that the CP/M version would cost the best part of £500".

". . . and with such vital house keeping features as an ambiguous word checker, the ability to edit the user dictionary, a comprehensive manual that is both easy to read and actually ENJOYABLE to learn from, . . . I feel confident that ROM-SPELL will woo the word processing public with no problems at all".

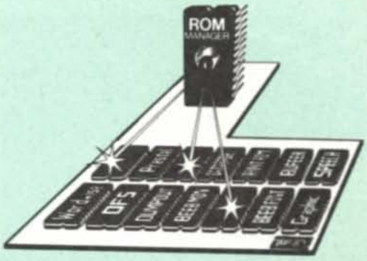
Compatible with: View, Wordwise & Wordwise +.

Don't settle for less, Buy the best.

£25

(Not compatible with 1770 DFS)
(Please state 40 or 80 track disc)

ROM MANAGER



Probably the most powerful way of expanding the BBC micro is from the use of Sideways ROMs. One problem faced by the avid ROM collector is that of ROM command clashes. The solution is very simple in the form of the ROM that "Provides comprehensive management of all your installed ROMs". (Quote from BEEBUG November '84.)

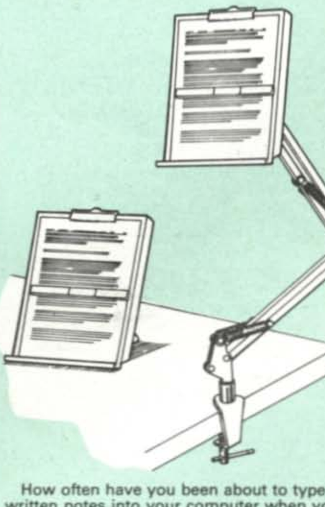
Basically, ROM Manager offers you the ability to turn off any installed ROM, or to send any * command to any specific installed ROM. It is said that imitation is the sincerest form of flattery – Acorn's BBC Plus features many of the abilities of this powerful ROM.

Many more facilities available.

SPECIAL OFFER £20

CREDIT CARD 24 HOUR
Ansaphone Hot Lines
(0923) 50234-33383

COPY HOLDERS



How often have you been about to type hand written notes into your computer when you find that there's nowhere to rest the paper or that your notes are resting at the wrong angle to read the type? Whether the notes be your latest program or the draft of a new trilogy, the new Manuscript Holders from Watford are superb for holding your paper at the ideal height and angle to allow you read and type in ease and comfort.

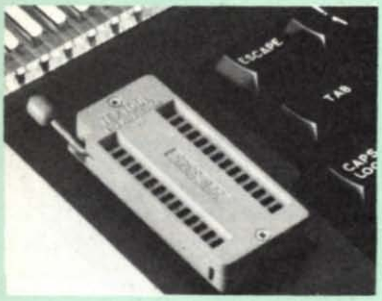
Available in 2 versions, desk resting and shelf clamping versions, these two units hold your paper firmly by means of a magnetic ruler and a clip grip.

Amazing value at only
Desk Top **£10** (carr. £2)
Angle poise **£14** (carr. £3)

All prices in this advert are exclusive of VAT.

Continued →

SIDEWAYS ZIF SOCKET



Allows you to change your ROMs quickly and efficiently, without opening the lid. The ZERO INSERTION FORCE (ZIF) socket is located into the ROM Cartridge's position.

- Very simple to install. NO SOLDERING required. The ZIF (Zero Insertion Force) eliminates the possibility of damage to your ROM pins when inserting & extracting.

- The low profile of the socket allows unrestricted access to the Keyboard.

- All data and address lines are correctly terminated to ensure correct operation of suitable ROMs with the BBC micro. We also supply a purpose designed see-through storage container with anti-static lining, allowing you to store up to 12 ROMs, protecting them from mechanical and static damage.

- This versatile hardware solves the problem of running out of socket space. Simply lift the ROM from the ZIF & insert a different one (No pulling or pushing of Cartridges. It is a must for all professionals and Hobbyists alike.)

- BBC, B+ and Master compatible.

ONLY **£15** (carr £2)

Low Profile CARTRIDGE SYSTEM

Complete System consists of: Low profile ROM Cartridge, Socket housing, Cable assembly, 5 labels and a library storage rack.

● Complete System	**£11**
● Spare Cartridges	**£2.50**
● Spare Rack	**£1.50**

16K Sideways RAM Modules

Complete with such features as read and write protection, these new modules from Watford Electronics are ideal for the hobbyist, software developer and ROM collector.
Key points to note about this new addition to the Watford range of products are:

- Write protection (useful in a variety of circumstances).
- Read protection (allows recovery from ROM crashes).
- Compact construction.
- May be fitted in systems even with a ROM board.
- Multiple units may be fitted, even with a ROM board.
- No overheating or overloading problems.
- Free utilities disc supplied.
- Can be used as a 16K PRINTER BUFFER.
- Ideal for professional software development.
- Supplied with utilities software disc.

Only: **£29** (carr £2)

Optional extras

READ and WRITE protect Switches **£2** each
Battery for Battery Backup **£3**

16K DISC RAM

Unlike other RAM boards, this revolutionary, battery backed up, write protectable 16K sideways RAM board allows you to run from disc every sideways ROM available.

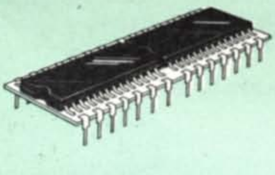
Features available are:

- No soldering or modifications to BBC micro necessary.
- Plugs into normal ROM socket fitting neatly under the keyboard allowing room for other add-ons.
- Easy to use. Comes with disk based software to SAVE and LOAD ROMs. Allows you to make backup copies of your ROMs.
- Disk software can be copied onto other discs when disc is full.
- No messy plugging and unplugging of your ROMs. Simply Load the one you want into DISC RAM.
- Ideal for Professional users to develop ROMs. Backup facility allows testing of final versions without using EPROMs.
- The switch provided allows backup and write protection to be switched off externally.
- Can also be used as 16K printer buffer RAM in conjunction with our Buffer & Backup ROM.

New Low Price: £32 (carr £2)

P.S. 16K DISC RAM Board is not designed to work in conjunction with a Sideways ROM Board.

SOLID STATE 16K SIDEWAYS RAM



This new unit from Watford, which utilises the latest in Static RAM technology, offers 16k of easy-fit sideways RAM in a very compact unit with a footprint no larger than a standard 28pin EPROM. With only a single flying lead terminating in a mini hook-on probe, to fit, (no soldering required) this compact unit works with any BBC Micro with or without a ROM board. ***Compatible with BBC B Plus.*** Like our other 16K RAM Modules, this unit is very simple to fit.

Only **£28** (carr 2)

Supplied complete with comprehensive software on Disc, Operating and fitting instructions.

Do you find the 16K Sideways RAM Units confusing? If so, we have compiled this quick questionnaire to help YOU decide which is the best one for you. If the answer to any of the questions is yes, then use the index number to select from the boards below. Options in brackets indicate possible secondary choices.

Do you require:

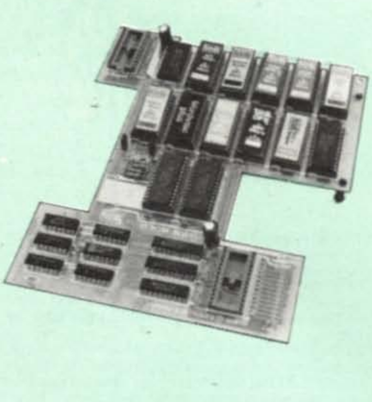
- Sideways RAM for a BBC B+ Choose 1, 2 or 3.
- Sideways RAM for the B+? Choose 3.
- A small, basic module? Choose 3.
- A sideways RAM module for a ROM board? Choose 1 or 3.
- An easy to use utilities disc[Choose 1, 2 or 3.
- More than one module installed at once? Choose 1 or 3.
- To use sideways RAM as a printer buffer? Choose 1 or 3.
- Battery Backup? Choose (1) or 2.
- Write protect for RAM (makes ROM look like RAM)? Choose (1) or 2.
- Read protect (allows recovery from crashes)? Choose 1.

Key:
1) 16k Sideways RAM Module
2) 16k Disc RAM
3) Solid State 16k Sideways RAM

GRAPH PAD 2

Supplied complete with Software
£60 (Carr. £3)

SOLDERLESS SIDEWAYS ROM SOCKET BOARD



In the May 1986 Micro User's independent review, the writer concludes, "The board has been well laid out. Its position is much better than others – not over the HOT RAM chips and further away from the disc controller area". "I give the solderless ROM board the thumbs up and wish it success".

This brand new board from Watford Electronics is designed specifically for those wishing to add a ROM board to their own BBC without the need to perform any soldering.

This new board expands the total possible number of ROMs in a BBC from 4 to 16.

Unlike our competitors inferior boards, the ONLY upgrade required for fitting battery backup to the Watford Solderless ROM board (all Watford ROM boards, actually) is the fitting of the battery itself. (No other expensive components are required.)

- The key features of this new, no fuss, easy to install quality product from BBC leaders Watford Electronics are as follows:
- Increase your BBCs capacity for ROMs from 4 to 16.
- **No soldering required.**
- Very low power consumption.
- Minimal space required.
- Compatible with Torch, DDFS, RAM Card, 2nd Processor, etc.
- Socket 14 takes two 6264 RAM chips.
- Read protect to make RAM "Vanish") allows recovery from ROM crashes.
- Battery backup option for RAM chips.
- Supplied ready to fit with comprehensive instructions.

Price: Only £32
Battery backup fitted **£36**
(carriage £2)

NEW

The BBC B+ Micro ROM EXPANSION BOARD

Specially designed for all BBC Plus users, this board sits in an external box, and will accept either 10 off 16k EPROMs, OR 10 off 32k EPROMs.

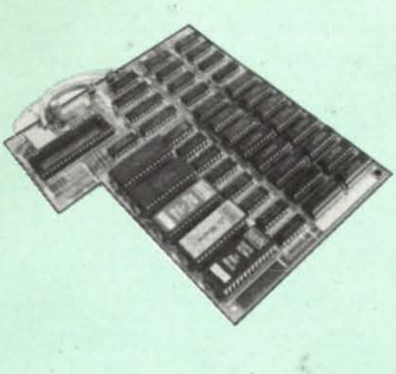
With the 32k EPROMs, only 5 can be 'online' at once (that's all the B+ can address, as each chip 'holds' two normal sockets worth), but you can swap between the two banks if necessary. With the 16k EPROMs, you can obviously address them all at once. An extra card can be added to permit 2 banks of 10 EPROMs to be used (again with only one bank available at once).

The ROM box, which has its own mains power supply, and connects to the BBC Plus via a specially designed card (which is a buffered card for your peace of mind) permits easy access to the EPROMs via the hinged lid. NO soldering is required for this board.

£79 (carr £2)

Watford ROM/RAM CARD

A must for all serious users



Watford Electronics announced the first ever commercial ROM board for the BBC micro, the Watford Electronics 13 ROM Socket Board 3 years ago. Following the success of this board, we have designed what probably represents the ultimate in expansion boards, the new Watford Electronics ROM/RAM board. This highly versatile and sophisticated board represents the latest in "2nd generation" sideways ROM technology for the BBC micro, designed to satisfy the serious BBC user.

- NO SOLDERING required to fit the board.
- NO overheating problems.
- No User Port corruption (avoids problems with the mouse, modems, Eprom Programmers, etc.)
- Fully buffered for peace of mind.
- Firm mounting in BBC micro.
- Compatible with all BBC micros (not BBC+ or Master).
- Total number of ROMs increased from 4 to 8.
- Up to 8 banks of sideways RAM (dynamic).
- Option for 16k of Battery backed CMOS RAM (CMOS RAM needs one ROM socket).
- Software Write protect for ALL RAM.
- Read protect for CMOS RAM (ALLEVIATES crashes during ROM development).
- Separate RAM write register (&FF30 to &FF3F).
- Automatic write to currently selected RAM socket for convenience.
- Accepts any ROM.
- FREE utilities disc packed with software.
- Compatible with our DDFS board, 32k RAM Card, Delta Card, sideways ZIF, etc.
- Large printer buffer.
- UNIQUE Fully implemented RAM FILING SYSTEM (similar to the popular Watford DFS).
- ROM to RAM load and save facilities.

The SFS (Silicon Filing System) can utilise up to the full 128k of RAM (with the SFS in any paged RAM) as a SILICON DISC. This behaves as a disc drive, with all the normal Watford DFS features (including OSWORD &7F for ROM-SPELL, etc.) to provide an environment that looks like a disc but loads and saves MUCH faster.

The ROM-RAM Board plugs into the 6502 CPU socket. This leaves free all the existing ROM sockets, which can still be used normally.

Any ROM that can be plugged into the BBC micro's own ROM sockets may be used in the ROM-RAM Board.

The ROM-RAM Board is supplied with all ordered options fitted as standard. Upgrade kits (with full instructions) are available for all of the options, for later.

Please write in for further details.

INTRODUCTORY PRICES:

● *ROM/RAM card with 32k dynamic RAM*	***£39***
● ROM/RAM card with 64k dynamic RAM	***£52***
● ROM/RAM card with a massive 128k dynamic RAM	**£80**

(carriage on ROM-RAM Card £3)

OPTIONAL EXTRAS:

● *16k plug-in Static RAM kit*	***£6***
● *16k Dynamic RAM for Upgrade*	***£7.50***
● *Battery backup*	***£3***
● *Read and Write protect switches*	***£2 each***
Complete ROM-RAM board (all options installed)	***£89***

Le Modem

The MODEM from Watford

At last a professional MODEM for the BBC Micro. Unlike other 'Modem packages' this is a complete package there are no extra software costs to get 'up and running'. Of course Le MODEM is multi-standard, i.e. 300/300, 1200/75 & 75/1200 UK and BELL (USA) are all supported.

The features that make Le MODEM such good value are:

- *A complete communications terminal that transforms your BBC Micro into a very powerful World-wide data transfer system.*
- *Auto Dials, Auto answers, and is completely controlled by your micro. There are no external controls!*
- *Allows you to access PRESTEL, B.T. GOLD, THE SOURCE, MICROLINK, MICRONET, MICROWEB, THE TIMES NETWORK, MICRO LIVE (BBC TV database), CITY BB and more.*
- *Designed to be SIMPLE but SOPHISTICATED. To LOGON to a data base all you have to know is its TELEPHONE NUMBER, Le MODEM does the rest.*
- *Supplied with a comprehensive telecomms package in a 16K sideways ROM which includes a FULL PRESTEL terminal allowing TELE-SOFTWARE to be downloaded.*
- *A comprehensive 80 column terminal. This includes XMODEM error checked transfer protocol, to allow error free data transfer anywhere in the world!*
- *FULLY controlled by simple '*COMMANDS allowing you to control it from your own BASIC programs. To get you started we supply a FREE disc of bundled software!*
- *Connects to the 1MHz bus. A *AUDIO ON-OFF command allows you to actually hear the telephone line through your BBC micro loudspeaker.*
- *Completely self contained with internal mains power supply. (Even a free mains plug is fitted!) A *TEST facility gives ON SCREEN indication that Le MODEM is working correctly.*
- *Packaged in such as way that you need nothing else except a BBC Micro to communicate with computers all over the world.*
- ***FREE Registration to MicroLink.***
- *BT Approval applied for.*

(When ordering, please specify the version required, (BBC or Master)

SPECIAL OFFER

Price: **£74**
(carr £3)

(Price includes, Le Modem, Software ROM, Cables & Comprehensive Manual)
(Write in for further details)

Nightingale Modem

SPECIAL PRICE to our Customers

£85

(Price includes: Nightingale Modem, Commstar ROM pack, Cables & Comprehensive manual)

Nightingale Modem without software	**Only £87**
COMMSTAR ROM package only (P&P on modem £2.00)	**£29**
Auto Dial Utilities Disc	**£9.50**

APOLLO

The NEW Modem from Watford

Following numerous requests from you, our discerning customers for an APPROVED, Low Cost & High Performance modem with Auto Dial & Auto Answer facilities as standard) we bring you the versatile APOLLO Modem. Just compare the features and look at the price (which incidentally includes the cost of the Software, manual and BBC connecting cable). We are sure you will agree that Watford Electronics in their traditional way are giving you a super 'value for money' deal.

Just look at these features:

- V21 for Bulletin boards, Microlink, Telecom Gold, etc.
- V23 for Prestel, Home Banking, and other Viewdata services.
- Reverse V23 allows User run Viewdata service.
- 1200-1200 half duplex for communications.
- XMODEM, HEX and ASCII file transmission.
- Auto Dial of given 'phone number.
- Auto Answer for User's Bulletin Board.
- 80 column terminal with split screen facility.
- Prestel text screen dump.
- Fully BABT approved.
- **FREE Registration to MicroLink.**

The Apollo is attractively finished in matt black. It opens the doors to world communication to both, the Hobbyist and the Professionals alike. With baud rates varying from 300/300 Originate and Answer, 1200/75 and 75/1200 full duplex and 1200/1200 half duplex, virtually all the popular tele-services can be accessed. A comprehensive Comms ROM oversees the use of the APOLLO, providing simple commands for all the software controlled facilities. APOLLO is an ideal modem for both the first time buyer and the seasoned user. Join the Telecommunications Revolution – Buy a Watford APOLLO!

Special Launch Price: **£75**
(Carr £3)
(Write in for full specification)

BT TELEPHONE CONNECTORS

LJU	1/4A Mini Line Master	**£4.50**
LJU	1/6A Mini Line Slave	**£3.00**
LJU	2/4A Line Master	**£4.00**
LJU	2/6A Line Slave	**£2.50**
LJU	3/4A Flush Master	**£3.95**
LJU	3/6A Flush Slave	**£2.75**
LJU	10/3A Dual Splitter	**£5.50**
	4 Way BT Plug	**£0.75**

Versatile **BEEB SPEECH SYNTHESISER** Unit

Beeb Speech Synthesiser

The Watford Speech Synthesiser is a very flexible speech synthesis unit based upon the powerful phonemes system. This system stores the building blocks of speech (called phonemes) and allows you to combine them quickly and easily to form virtually any word imaginable.

Supplied with an advanced ROM, you are provided with a 500 word dictionary to get you started. These can easily be added to by following the notes given in the comprehensive manual.

SPECIAL PRICE £32 (carr £2)

Continued →

COMPUTER CONCEPT'S ROMS

ACCELERATOR	£48
CARETAKER Basic Utility	£25
DISC DOCTOR	£28
Graphics ROM	£23
TERMI	£25
COMMUNICATOR	£49
SPEECH ROM	£24
Printmaster	£24

Wordwise

£24

Wordwise plus

WORDWISE PLUS

£40

We are giving away absolutely **FREE,** the superb Word-Aid ROM worth £24, with every WORDWISE PLUS package bought from us.

Word-Aid

The most comprehensive utilities ROM for Wordwise-Plus

Extend the power of your Wordwise Plus word processor with this most advanced ROM from Watford. By utilising the powerful Wordwise Plus programming language, WordAid provides a whole host of extra features, all accessed via a special new menu option. This ROM has been personally approved by Mr Charles Moir, the author of WORDWISE PLUS.

- Alphabetical sorting of names and addresses.
- Text transfer options.
- Chapter marker.
- Epson printer codes function key option.
- Search and display in preview mode.
- Embedded command removal.
- Print Multiple copies of a document.
- Multiple file options for print and preview.
- Address finder.
- Label printer.
- Mail-merger.
- Number/delete/renumber.
- Clear text-segment area.
- BBC B, B+ and Master compatible.

Only **£24**

(N.B. Word Aid requires a Disc Interface in your Micro)

HI-WORDWISE-PLUS

Supplied on disc. This version requires a WORDWISE-PLUS ROM to be present in the machine. It gives up to 44k of text space on the 6502 2nd processor.

£5

Inter SHEET ONLY £37

INTER-CHART

ONLY: £26

Inter-WORD

Only: £42

Special Discount price for the existing Wordwise Plus owners. Simply quote your reg. number and pay.

Only: **£39**

All Prices Exclusive of VAT

VIEW

VIEW WORDPROCESSOR 2.1	**£37**

VIEW 3.0 ROM

Price: Only **£54**

HI-VIEW (for use with 6502 2nd Processor)	**£36**
VIEW Printer Driver Generator Please specify Disc or Cassette)	**£9**
VIEWSHEET (Acornsoft)	**£37**
VIEWSTORE	**£37**
VIEWSPELL with 80 track disc	**£29**
VIEWPLOT Disc	**£22**
VIEW-INDEX	**£12**

Watford's own Sophisticated VIEW PRINTER DRIVER for Epson FX80 & KAGA KP

Only £10

VIEW DRIVERS FOR JUKI & BROTHER HR15 PRINTERS

Only £10

VIEW-VIEW SHEET PRINTER DRIVER for SILVER REED

(Officially approved by Silver Reed)

Only: £10

MINI OFFICE II (disc)	**£14.50**

REPLICA 3

This new improved REPLICA 3 from Clares is a very powerful disc based TAPE to DISC Utility. It now transfers even more programs than ever before. Replica 3 will not work with all programs but then neither will anything else. 30,000 Replicas have been sold to date. It has to be good.

£13 (40 or 80 track)

النور

ARABIC ROM
for the BBC Micro

The ALNOOR ARABIC ROM converts your BBC into a bilingual computer. New keytops provide both English and Arabic symbols. Two sets of Arabic symbols are provided for use in either context sensitive or insensitive operation.

20, 40 and 80 column operation. Compatible with ASMO (449). English-Arabic printer interface software. Numeric entry from either left or right of number. Communications software to send or receive 7 or 8 bit data.

Different shapes of Vowels (e.g. Shadda, Fatha, etc). Different shapes of Hamza. Full English and Arabic character sets with all special characters.

£85

(Price includes Alnoor ROM, Operating Manuals & a full set of Arabic/English Keytops)

VIEW PRINTER DRIVER ROM

(Professional facilities for demanding users)

View is a powerful word processor, but until now has seriously lacked in terms of printer support. With the launch of our Printer Driver ROM, which includes an extremely powerful and easy to use Printer Driver Generator, View users can find themselves in the realms of advanced word processing only at a small outlay.

The VPD extends View's printer command with a series of mnemonic commands. All standard highlight sequences are also supported. A large range of printers are supported by drivers contained within the ROM (the drivers can be downloaded and customised). Printers supported include: Epson's MX, RX, FX, FX, LX, JX80 range, HI80, KP810/910, PW1080, JP101, HR15, M1009, GLP, JUKI 6100, etc.

Other printers are readily supported by defining a Printer Driver using the built in Printer Driver Generator. The features mentioned below are available to both the built in Printer Drivers and user defined drivers (assuming the printer supports the features).

NLQ control, Underline, Bold, Proportional Spacing, Microspacing, Italic, Superscript, Subscript, Condensed, Enlarged, Double Strike, Set lines per inch numerically (e.g. LPI 6), Set characters per inch numerically (e.g. CPI 5), Select printer font, Select printer ribbon colour, Translation sequences, Emulation of BBC Character Set, Simple numeric expressions for certain operations, Full printer setup, Send control codes, Print prompt on screen, Redefinable Pad character, Pause for key press, Prompt to change daisywheel, and Execute * command when printing.

Other features include a very powerful on screen preview, with bold, italic, underline, super/subscript, enlarged highlights, and a special printer driver to allow memory based text to be previewed by View 1.4. Of course, View 1.4, 2.1 and 3.0 are all supported, as is Shadow RAM and 6502 Second Processors. The BBC B series and Master series of micros are supported. A comprehensive manual is supplied. All in all, a very professional product for the discerning user who wants power at their finger tips. (Write in for a detailed leaflet).

Price: Only £33

CREDIT CARD 24 HOUR
Ansaphone Hot Lines
(0923) 50234-33383

THE INVESTIGATOR

This sophisticated Utility program on disc, enables you to make security back-up copies of most of your valuable Disc Software. Makes full use of all 8271 (will not run with double density DFSs) facilities to discover the precise format of your protected disc so that an exact copy can be produced. Supplied with detailed instructions. Please specify 40 or 80 track disc when ordering.

Only **£20**

ROMAS

THE CROSS ASSEMBLER AND MACRO EDITOR FOR SERIOUS PROGRAMMERS!

ROMAS is a carefully designed, sophisticated yet simple to use, development system for serious assembly language programmers. Using the BBC as the development system, you can choose your target system from the following processors:

6502, 65C02, Z80, 8085, 8041, 6809 and Z8
P.S. This includes the Acorn 6502 & Z80.

A give away at . . . **Only £29**

Please specify 40 or 80 track disc when ordering.

ARIES CORNER

Aries B-32 Shadow RAM Card

18 months of intensive research and development have produced a worthy successor to the widely acclaimed Aries-B20: the revolutionary Aries-B32. This 'second generation' expansion board features 32k of RAM and a 16k ROM socket.

Like the BBC B+, the B32 provides 20k of shadow screen RAM and 12k of sideways RAM. Unlike the B+, the B32 has simple software commands which allow the user to reconfigure the RAM as 16k of shadow RAM and 16k of sideways RAM, or all 32k as sideways RAM.

With the B32, the programmer gets up to 28k of RAM available for Basic, Logo, Comal, Forth, Lisp and BCPL programs in any screen mode. The business user gets extra memory for View, ViewSheet, Wordwise Plus and many other applications. For advanced applications, the scientific user gets access to a massive 47k of data storage using the Acorn approved *FX call.

Sideways RAM enables you to load sideways ROM images from disc, allowing you to have a large library of sideways ROMs (subject to the copyright holder's permission) stored on disc. The B32's sideways RAM can also be used to extend any operating system buffer (such as the printer buffer) or to load tape programs into a disc system.

The B32 simply plugs into the processor socket on your BBC micro – no flying leads to connect and no soldering. Provision of the on-board ROM socket means that the Aries-B32 control ROM does not use up one of your existing ROM sockets.

Price: B-32 **£80** (carr. £2)

Aries B-12 Sideways ROM Board

This board is extremely well made, simple to install, reliable when fully loaded and compatible with the Aries B-20 and the Aries B-32. For the business user or educationalist, the compact and secure internal fitting is ideal, with the ROM board tucked neatly inside the lid where it will not cause overheating problems. The serious software developer and the hobbyist may prefer to mount the board externally, giving instant access to the sockets for experimental purposes. A zero-insertion force (ZIF) socket may be fitted to the board to enhance this mode of operation.

The B12 provides a total of twelve sideways ROM sockets (the four in the original machine are replaced by the twelve on the board), all fully accessible by the MOS sideways ROM system. In addition, there are two sockets for sideways RAM, giving up to 16k of RAM using 6264 static RAM chips.

The B12 system consists of two parts: a large detachable 'mother board' which carries the extension ROM sockets and a small 'base board' on a short ribbon cable, which plugs into the existing sideways ROM sockets. This two-board design eliminates the reliability problems previously associated with some other ribbon-cable based systems.

If you do not have an B32 or B20, a small adaptor module (the Aries B-12C) is available at a nominal cost. The 6264 static RAM chips used to provide the sideways RAM are advertised elsewhere in our advert.

Price:
Aries B-12 **£40.** Aries B-12C **£5**

THE ARIES RANGE HARDWARE REQUIREMENTS

Aries B-32 & BBC B, MOS 1.20, hardware plugs into CPU socket.
Aries B-12 & BBC B, MOS 1.20, hardware plugs into all four sideways ROM sockets and connects to the B32 or the B20. The adaptor Aries B-12C module is necessary where these are not fitted.
Aries B-488 BBC B, MOS 1.20, Hardware plugs into 1MHz Bus.

ARIES B-488 IEEE-488 INTERFACE UNIT

The Aries-B488 is an interface unit to enable the BBC micro to control and monitor IEEE-488 bus systems. The IEEE-488 bus (also known as the 'GPIB' or 'HP-IB') is the standard method of interconnecting programmable laboratory instruments and control equipment. Using the B488, up to 15 devices may be connected in a single high-speed data network.

Aries B-488 Unit: **£238** (Carr £3)

OFFICE MASTER

Office Master

CASHBOOK – A complete "Stand Alone" accounting software package for the cash based sole trader/partnership business. It is designed to replace your existing cashbook system and will provide you with a computerised system complete to trail balance.

FINAL ACCOUNTS – Will take data prepared by the Cashbook module and produce a complete set of accounts as following: Trial Balance with inbuilt rounding routine; Notes to the accounts; VAT Summary; Profit & Loss A/C; Balance Sheet.

MAILIST – A very versatile program. Enables you to keep records of names and addresses and then print, examine, sort and find them, all with special selection techniques.

EASILEDGER – A management aid software tool designed to run alongside an existing accounting system. Essentially a Debit/Credit ledger system which can handle sales, purchase and nominal ledger routines to provide instant management information.

INVOICES & STATEMENTS – Greatly reduces the time and cost of preparing Invoices and Statements by storing essential information like customer names, addresses and account numbers. Has VAT routines and footer messages facility.

STOCK CONTROL – Allows you to enter stock received, stock out, summary of stock items and current holdings together with details of total cost, total stock to minimum level, units in stock ordering, quantity and supplier detail.

All this for only **£21**
(Cassette or Disc)

OFFICE MATE

Office Mate

- DATABASE
- BEEBCALC SPREADSHEET
- BEEBPLOT GRAPHICS
- WORD PROCESSOR

DATABASE – Set up a computerised "card index" system and add records/data to the file your way. Features include search, sort, mathematical calculations, printer routines, data summaries, etc.

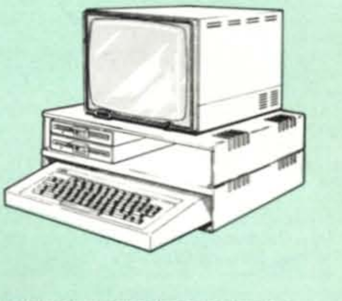
SPREADSHEET – Offers a wide range of invaluable calculation and editing features. Beebplot will take files created by Beebcalc to provide data portrayal in graph, histogram or pie chart format.

BEEBPLOT – Provides an easily assimilated visual representation of numerical data.

WORDPROCESSOR – Provides many routines found in large and expensive packages.

OFFICE MATE Only £10
(Cassette or Disc)

PLINTHS FOR BBC MICRO, MASTER & PRINTERS



Protect your computer from the weight and heat of your monitor. The BBC micro plinths have slots for maximum ventilation. The single plinth is suitable for a BBC and monitor, whilst the double height version provides enough room for our stacked or side-by-side dual disc drives or TORCH Disc pack, to be placed in the centre section. If you use our stacked drives, the remaining space can be used for further peripherals e.g. Speech Synthesizer, EPROM programmer or simply stationery. The computer slides neatly in to the lower section allowing easy access to remove the lid. The printer plinth is equally sturdy but without the cooling slots. It allows for access to the paper from the front as well as from the rear, (a facility not often thought of in similar products) if the paper is located beneath the plinth. This is a very convenient way to work especially if your work area is not deep enough to take the printer and paper separately.

SINGLE BBC PLINTH	**£11** (carr. £1.50)
DOUBLE BBC PLINTH	**£20** (carr. £2.00)
PRINTER PLINTH	**£10** (carr. £1.50)
SINGLE MASTER PLINTH	**£14** (carr £1.50)
DOUBLE MASTER PLINTH	**£25** (carr £2.00)

THE EUREKA CARD

(The Unique RAM Expansion System)

The Eureka Card is Watford's latest and most sophisticated RAM expansion system. Using advanced PAL based technology this card is a breakthrough in RAM systems for the BBC micro. The Eureka Card provides the user with around 58K of free memory in Basic, VIEW and WORDWISE PLUS. You also get Shadow RAM from within the active language. No other RAM expansion system can match that!

Load up to 58K long Basic programs. Texts in VIEW and WORDWISE PLUS up to 58K as well. This with absolutely NO loss of speed in accessing your text or program. Eureka consists of a card containing 64K of program memory, two parallel banks of sideways RAM and some extremely complex switching circuitry. This is all controlled by Eureka's highly sofisticated software supplied in ROM. Designed to a very high specification, this board is fully buffered to give reliable operation under virtually any circumstances.

The Eureka board plugs into the 6502 socket and has NO messy flying leads. It is compatible with many other products from Watford, such as our Solderless ROM Board and our ROM/RAM Board. All in all, the Eureka Card is an amazing board. Jump into the age of serious data processing with a Eureka Card! Please write in for further details 'on advantages the Eureka can offer you'.

Introductory price: Only **£89** (carr £3)

(P.S. Eureka is only suitable for a standard model B; it normally replaces any Shadow RAM cards present. Some speed degradation does occur with filing system access. Eureka cannot be used at the same time as a second processor).

BEEBMON

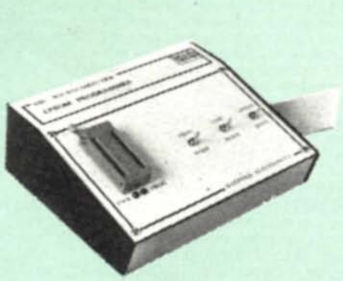
The most powerful machine code monitor for the BBC Micro **£24**.

Continued →

BOOKS (No VAT on Books)

15 Hrs Word Processor Using BBC	£3.95
30 Hour BASIC (BBC Micro)	£7.95
40 Best machine Code Routines	£7.95
6502 Assembly Language Program	£19.95
6502 Application	£11.95
6502 Assembly Lang. Subroutines	£19.95
6502 Development System	£7.50
6502 Machine Code for Humans	£7.95
6502 Reference Guide	£9.95
68000 Assembly Lang. Programming	£19.95
68000 Machine Code Programming	£13.00
68000 Programming the	£22.95
6809, Programming the	£16.95
Art of Music Graphics	£14.95
A User Guide to Wordwise Plus	£9.95
A Young persons Guide to BBC Basic	£5.95
Advanced Disc User Guide	£16.95
Advanced BASIC ROM User Guide	£9.95
Advanced User Guide for BBC	£15.95
Advanced Graphics with BBC	£9.95
Assembly Language Programming on BBC Micro	£11.50
Adventure into BBC BASIC	£6.95
Applied Assembly Lang. for BBC	£9.95
Assembler Routines for the 6502	£7.95
Assembly Language Programming FOR the BBC Micro	£8.95
Assembly Language Programming on the BBC & Electron	£8.95
Basic ROM User Guide	£11.95
Basic User Guide for BBC Micro	£10.00
BBC B Compendium	£5.95
BBC B+ User Guide	£14.95
BBC BASIC for Beginners	£7.95
BBC Forth	£7.50
BBC Hardware Projects	£8.95
BBC Micro & the small Business	£5.75
BBC Micro ROM Book	£10.95
BBC Master 128 High Flyer	£10.95
BBC Micro Advanced Ref. Guide	£10.95
BBC Micro Disc Companion	£8.95
BBC Micro File Handling on	£6.95
BBC User Guide	£10.00
BBC Software Projects	£6.95
BBC Wordprocessor Beginners Guide	£7.95
BBC Within the Micro	£13.95
BCPL User Guide	£14
Complete FORTH	£6.95
CP-M-86 User's Guide	£19.95
CP-M Bible	£16.50
CP-M Handbook with MPM	£9.95
CP-M Plus Handbook	£13.95
CP-M Soul of	£16.50
CP-M The software BUS	£8.95
Creative graphics on BBC Micro	£7.50
Disc Drive Projects for Micros	£5.45
DISC FILING SYSTEM (DFS) Operating Manual for BBC	£6.95
Disc Programming Techniques	£9.95
Disc System for the BBC Micro	£6.95
Exploring FORTH	£6.95
FORTH on the BBC Micro	£7.50
Functional Forth for the BBC Micro	£5.95
Guide to BBC ROMs	£9.95
Graphs & Charts on BBC Micro	£7.50
Hackers Handbook - New	£6.95
Interfacing & Robotics on BBC	£15.95
Into View	£4.50
Introduction to COMAL	£9.50
Introduction to LOGO	£6.95
Introducing 'C'	£9.95
Introducing LOGO	£5.95
Introduction to FORTH	£8.95
Introduction to PASCAL	£17.95
ISO-PASCAL Reference Manual	£9.95
LISP 2nd Edition	£14.95
LISP, A Beginners Guide to	£10.95
LISP the Language of Artificial Intelligence	£9.95
Logo Programming	£9.95
Mysteries of DISC DRIVES and DFS REVEALED	**£5.95**
Mastering Assembly Code	£8.95
Mastering CP-M	£17.95
Mastering Music	£6.95
Mastering the Disc Drive	£7.95
Master Advance Reference Manual	£19.95
Master Reference Manual Part 1	£14.00
Master Reference Manual Part 2	£14.00
Micronet Handbook	£6.95
Points of View	£6.95
Programming the 6502	£16.95
Programming the Z80	£19.95
Structured Basic	£7.95
Structured Prog. with BBC BASIC	£6.50
The Complete FORTH	£6.95
The Epson FX-KAGA PRINTER Commands REVEALED	**£5.95**
Turtle Graphics on BBC Micro	£7.50
Using Floppy Discs with BBC Micro	£5.95
View 3.0 User Guide	£10
View Guide	£4.50
Viewsheet User Guide	£10
Viewstore User Guide	£10
Using BBC Basic	£4.95
Wordprocessing BBC Beginners Guide	£7.95
Wordstar & CP/M made easy	£7.45
Wordwise + A User Guide	£9.95
Z80 Applications	£15.95
Z80 Assembly Language Programming	£19.95
Z80 Reference Guide	£9.95

EPROM PROGRAMMER



The Watford Electronics' EPROM programmer for the BBC micro is a high quality self contained package. Programs all popular EPROMs from 2K to 16K: 2716, 2516, 2532, 2564, 2764 and 27128. All manufacturers' specifications have been followed to program EPROMs at the correct speed – wrong timings could destroy your EPROMs. The unit has its own power supply so does not put heavy loads on the BBC power supply as do some other units. Connects directly to the 1MHz bus following all Acorn recommendations on addressing and bus loadings.

SOFTWARE PACKAGE
The software is supplied on an EPROM which plugs into the Micro and is instantly available with a single command (no time wasting as on Cassette-disc loading). It is a fully purpose designed and ingegrated package to simplify ROM development. The system is menu driven with many prompts to avoid any accidents.

Software facilities include:
Load File – Save File – Down Load EPROM – Program EPROM – Verify – Blank Check – Editing of memory contents prior to programming.
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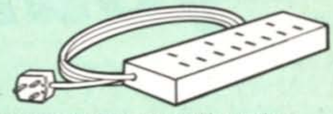

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Safe power from
a car battery:
Mike Cook shows how

Plug into your Jag

FOR some time now people have been asking me to provide a method of powering the BBC Micro from a car battery. Most people who ask assume that it is a simple matter – after all there are integrated circuit voltage regulators available so why not simply use one of those?

Well to be honest it is not as simple as that and I knew it, hence the reluctance. Also I was a little wary about the liability which might be involved in producing such a kit.

After all, unlike any of my previous projects, the potential to damage your computer is there.

However, I was galvanised into action by yachtsman Peter Pederson, who phoned me one Thursday to request just such a device. I asked him when he was sailing and when he said "Tuesday", I swung promptly into action.

To begin with the BBC Micro has a power supply capable of delivering three different voltages, 5V, −5V and 12V.

In fact the computer only needs the first two to operate and you can even do without the −5 volt supply if you don't want the sound, tape storage and serial ports.

So let's look first of all at how to supply the +5V and we can worry about the other voltages later.

A car battery is nominally 12V but it can range between 13.5 and 9V depending on its state of charge. This must be reduced to a stable 5V as computer circuitry can only work between 4.75 and 5.25V.

The simplest way to reduce the voltage is shown in Figure I. This is just a resistor in series with the computer: if we choose the value correctly it will drop the excess voltage and leave 5V for the running of the computer.

Those of you not already convulsed with laughter will not be surprised to know that when someone once asked me to calculate the resistor value for them I declined.

This simple method will not work for many reasons, the main one being that the computer does not draw a constant amount of current.

The current demand of the computer changes during every part of the clock cycle so for this system to work we need to make the resistor variable and to make it change it in sympathy with the computer's changing demands.

Of course this is impossible simply with a resistor but we can do something similar with a transistor.

Figure II shows the basis of a simple transistor series regulator. The transistor is working in the common emitter mode and this is sometimes called an emitter follower.

The name tells you how it works: Whatever voltage you place on the base, the voltage on the emitter follows it.

In fact the emitter voltage is always 0.7V lower than the base voltage due to the forward voltage drop on a silicon junction.

But if the voltage is constant and the emitter's load (our computer) varies then the transistor must pass a variable amount of current in order to keep the emitter voltage constant.

The transistor will have a current gain so the current we need to supply to the base is small compared to that the emitter will supply.

Figure II shows a zener diode supplying a constant base voltage. For those who have not met them, zener diodes have a predictable, and almost constant, forward breakdown voltage and they are often used for small current power supplies.

Most voltage regulator ICs are based on the series transistor principle and you can quite easily get devices that will pass the 3 amps required to power the BBC Micro.

However, a closer look at these devices reveals that although they will pass the current they will not handle the power dissipation.

If we have 13.5V being reduced to 5V then the difference (8.5V) is dropped across the series regulator. This, coupled with the 3 amp current, results in a 25 (8.5x3) watt power dissipation.

That is as much power as most soldering irons and it is not easy to get a device to dissipate that much heat, so the series regulator solution is not very practical.

Incidentally, using a series regulator it would be impossible to generate the negative voltage needed.

The modern solution to low voltage, high current power supplies is the switching regulator – there is one inside your computer already.

This uses a high voltage, low current mains transformer and converts it into a low voltage, high current source for your computer. To see the principle look at Figure III.

If the switch is closed the voltage on

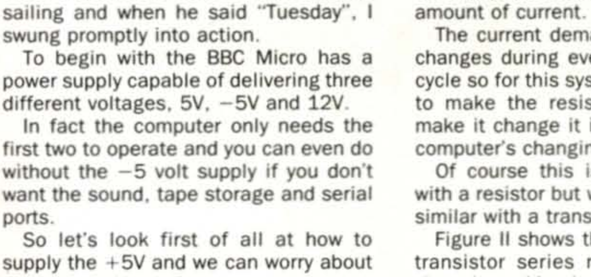

Figure I: Simple minded approach

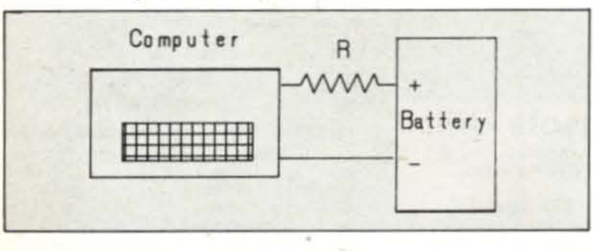

Figure II: Simple series regulator

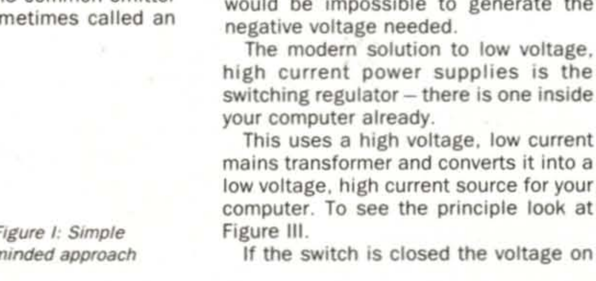

Figure III: The principle of a switching regulator

THE BEEB BODY BUILDING COURSE

the capacitor will start to rise. Eventually it would reach the same value as the input voltage but what we do is to measure the voltage rising and when it reaches the value we want we turn the switch off.

What happens then is that current drains out of the capacitor into the load and the capacitor voltage drops. We sense this and give the switch a quick dab on to raise the voltage again. If we do this fast enough we can maintain a steady voltage.

In practice the use of a resistor would absorb too much power and so we use an inductor. This has the property of resisting rapid changes in current while it maintains a low resistance.

Hence we get a voltage rise on the capacitor slow enough to measure and feed back the signal to control the switch. Figure IV shows the basis of a practical switching regulator.

The transistor T1 is turned on and off at a fixed frequency but the ratio between the on and off times is constantly being changed by a pulse width modulator.

'The switching transistor will dissipate comparatively little power'

This is fed an error signal derived from the difference between a reference voltage and what is actually being produced at the output.

You will notice that we have also added a diode in the circuit. This is because when you suddenly switch off the current from an inductor, the magnetic field it created collapses and generates a reverse voltage. The diode catches this and allows recirculation current to flow.

The eagle-eyed among you might be saying, "It's all very well but we still have a transistor passing all the current". This is true but now the transistor is either on or off.

When it is off there is lots of voltage across it but no current through it: When it is on there is lots of current flowing but very little voltage dropped across it.

As the power dissipation is given by the product of the voltage and current you can see that the switching transistor will dissipate comparatively little power.

Compare this with the series regulator where the transistor was half on and half off, acting effectively like a variable resistor.

There are a number of integrated circuits available to aid the construction of a switching regulator.

When I was searching for a device to use, the L296 from SGS caught my eye because it contained nearly all the components required to make a high current regulator – in one package. While it's not cheap, it is reasonably priced for what it does.

The circuit of a battery powered BBC Micro supply regulator is shown in Figure V. A quick glance will reveal that it will supply the −5V as well as the +5V.

This is achieved by winding an extra coil on the inductor and in effect making a transformer. The voltage is then rectified with a simple diode and capacitor.

The regulation (stability of voltage with increasing current) is not as good as the +5 volt side but then in the BBC Micro it does not have to be.

The oscillator is set to run at 100KHz by R1 and C1 and the stability of the feedback loop is controlled by C2, C3 and R2.

There is a soft start mechanism that slowly applies the power to your computer and the time taken to achieve full power is controlled by C4.

On the output side, D1 is not just any old diode but a very fast Schottky power diode. If you used a slow diode then the charge storage could build up a high voltage and cause reduced efficiency and excess power dissipation.

T1 is a safety device – a Silicon Controlled Rectifier (SCR) which can protect against over-voltage. An SCR is normally like an off switch but when a small voltage is applied to the base it turns on.

The point is that it remains on even when the gate signal is removed. The only way to turn an SCR off is to reduce the current through it to zero or below.

Incidentally, a current below zero is just a current flowing in the opposite direction.

What happens is that inside the L296 there is a circuit that monitors the output voltage. If it is larger than it should be, it generates a voltage on pin 10.

This fires the SCR and it shorts out the output thus preventing the excess voltage being applied to your computer and damaging it.

You will only get an over-voltage output when the switching transistor of the L296 is permanently closed. The SCR is chosen so that it will withstand this short circuit current and the only device to blow will be the L296.

This is infinitely preferable to blowing all the chips in your computer and anyway it will probably only be triggered when the L296 is faulty.

To protect itself from excess current the L296 has a current limiting mechanism. Current flowing through it is passed through a resistor and the voltage across that resistor is monitored.

When it exceeds a certain value, the switching transistor is turned off. This will cause the current to rise again but, due to the soft start mechanism, this happens slowly.

So that under short circuit conditions the maximum current flows and triggers the over-current sensor, the current then drops to zero and the soft start mechanism slowly ramps up the current until the limit is reached.

This means that the average current flow during short circuit conditions is considerably less than the maximum.

To turn the power on and off you can switch the battery lead. However, this

Turn to Page 98 ▶

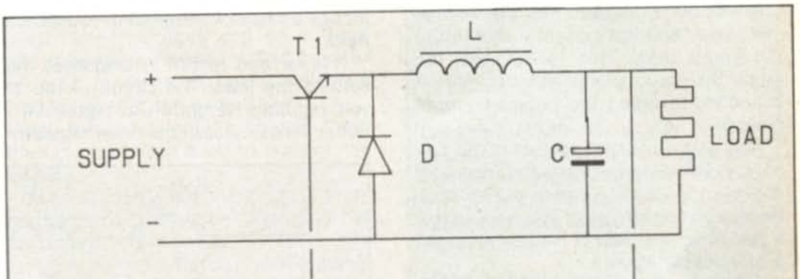

Figure IV: A practical switching regulator

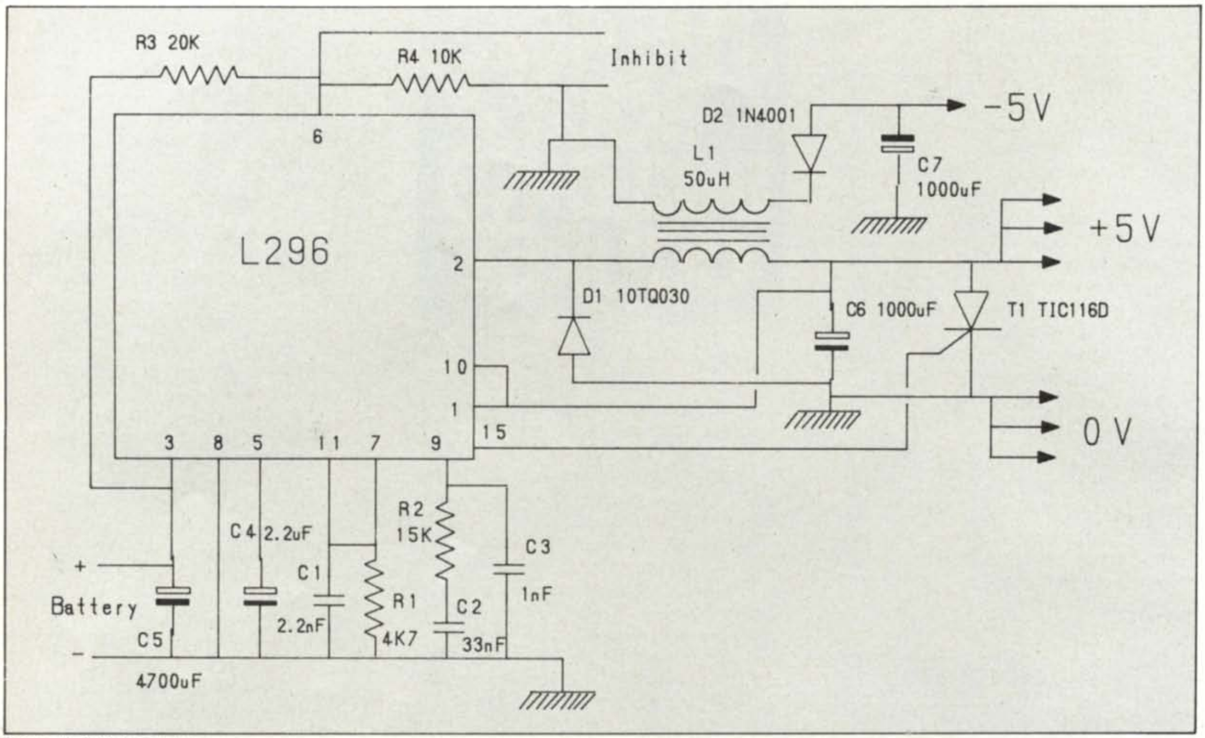

Figure V: 5 Volt regulator

◀ **From Page 97**

involves switching heavy currents. An alternative is to use the inhibit feature of the L296.

This stops the regulator from switching until the inhibit leads are shorted out. And as this only takes a few milliamps any miniature switch can be used.

The power supply is capable of supplying slightly more current than the computer's own supply. In theory there should be 4 amps available but I have not taken it that far.

When testing this I used my bench power supply so that I could try the effects of different input voltages.

It was quite weird to see the voltage meter rise and the current meter fall at the same time. This is because the larger the input voltage the less current is needed to supply the same amount of power.

Now we turn to the problem of the 12V supply. This is not used by the computer itself but is used to power a disc drive along with the 5V. So, if you want to use a disc drive with your computer you need a 12V supply as well.

This presents a problem because regulators usually need a few volts greater input voltage than output voltage.

In addition you remember I said that a battery voltage can drop below 12V so what we need is a circuit that will supply a constant 12V even when the battery drops below this value.

Well it turns out that a variation of the switching supply can be made that steps up the input voltage. The principle is shown in Figure VI.

In addition to the switching regulator switch S1 there is a switch S2 that connects the inductor to ground: They are both switched together.

When they are on the inductor builds up a magnetic field around it but no power is supplied to the output. However, when the switches turn off the field collapses very rapidly.

It is the speed of change of a magnetic field that determines the voltage it induces, so a rapidly collapsing field will induce a higher voltage than caused the field.

This is then rectified, smoothed and sent to the load. The circuit of the 12 volt regulator is shown in Figure VII – notice it is similar to the other regulator.

The step up function, implemented by the second switch, is done with a power FET. As we want a 12V output we must feed a fraction of the output voltage back into the L296 and this is done by R5 and R6.

No crowbar over-voltage is implemented as, when running from a battery, any over-voltage will not be sufficient to damage a disc drive.

As you only want to run the disc motor when you are loading and saving programs there is a switch to turn off the regulator. The lines marked inhibit should be shorted to ground to turn the modulator on.

To save battery power only switch this on when you are about to use the drive or it can be connected to the same switch as the other regulator.

If you are going to use two switching regulators, it is important that the switching be synchronized to prevent all

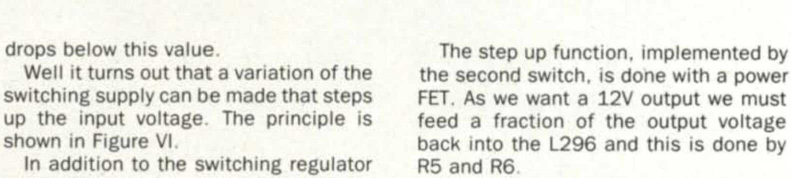

Figure VI: Voltage step up principle

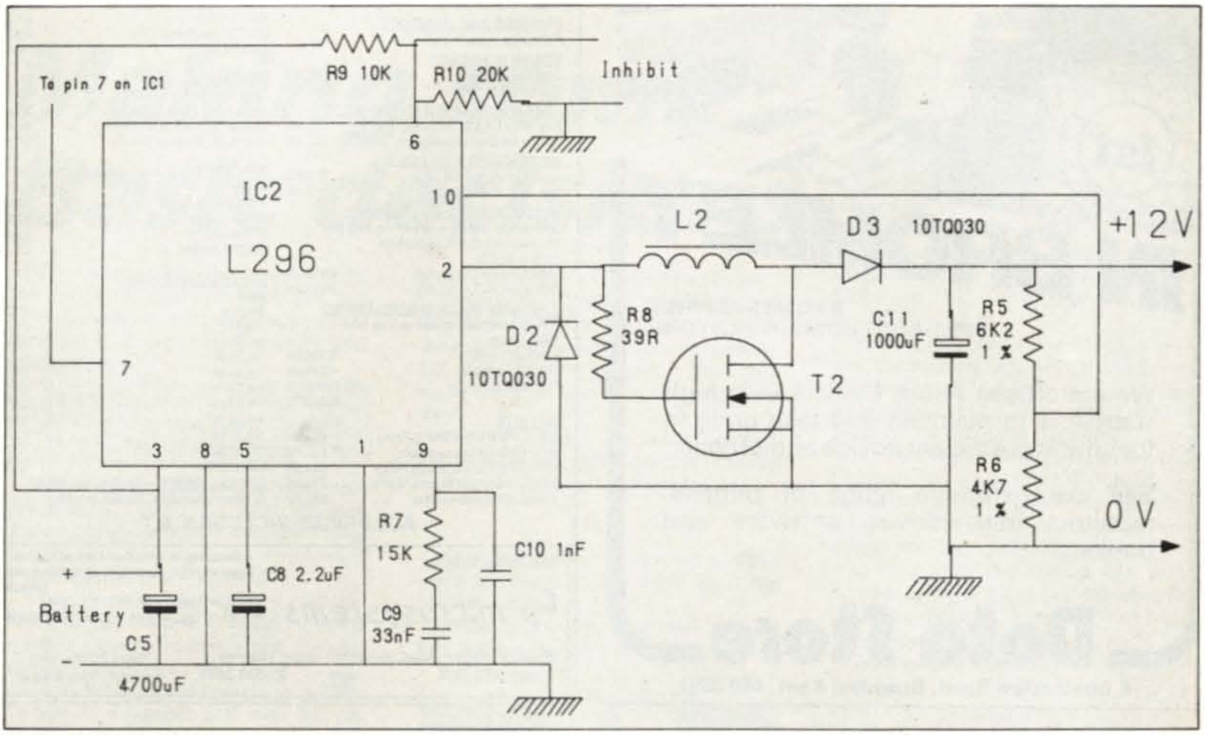

Figure VII: 12 Volt regulator

sorts of nasty intermodulation.

Fortunately, the L296 has a provision for synchronizing with an external oscillator, in this case the 5V regulator.

The coils should be wound on a toroidal core with a soft saturation characteristic, the number of turns depending on the type of core material you use. As these inductors are rather difficult to wind I have had them specially made for this project.

'Switching from mains to battery can be tricky'

Layout is quite important as well because all the heavy current earth lines need to be separated from the signal earth lines and joined only at one point.

Also, as these regulators are switching at high speed it is important to keep all the lines as short as possible to prevent the introduction of distributed inductances.

To this end I have laid out a printed circuit that includes both regulators. This along with all the other components is available as Body Build pack Number 41. The order form is on this page.

Note that you can obtain the pack in two versions: One that contains just the components to produce the two 5V supplies and the other that includes the 12V supply as well.

Also included in the latter pack is an auxiliary power socket just like the one on the BBC Micro to plug your disc drives into.

Having made the regulators you now have to install them. The simplest way is to replace the spade connectors with wires from the switching regulators. The two inhibit switches should mounted at a convenient place.

Alternatively you might want to switch from mains to battery operation. This can be tricky because of the contact resistance of the switches causing a voltage drop.

Remember also that you will have to switch three voltages and so a three pole change-over switch would have to be used or three separate switches changed over at the same time.

Also remember only to change them when the computer is off to prevent any damage.

On no account float charge the battery (charge the battery while operating the computer). This is because most battery chargers are not isolated from the mains and therefore, if you use them your computer becomes connected directly to the mains, a condition that could prove fatal.

● *So there you have it. Free from the mains at last. Free to use your computer in the garden, caravan or even sailing around the world. See you next month.*

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MU3

FAST DELIVERY

Nigel Peters goes into the decisions game with the IF . . . THEN structure

Making some Basic decisions

AFTER our forays into arrays last month, I've decided to deal with decisions this time. So with no more ado let's look at Program I, a classic of brevity and uselessness.

```
   10 REM Program I
   20 INPUT"Give me a number ",number
   30 PRINT number
```

It's almost spectacularly silly. In case you haven't figured out what the program's doing – probably because it's so simple you feel that you must have missed something – I'll explain.

Line 20 prompts you for a number. When you give it one, it is stored in the numeric variable *number*– and the next line just prints this out.

So all the program does is to get you to type in a number and then tell you what you've typed in.

Notice that you give the program a number and it *has* to print it out, whatever the number is. It has no choice.

This is something that all the programs so far have in common. The micro runs them line by line, one after the other, sometimes going round loops but always obeying every statement. It has no choice as to whether it does a line – it just does it.

The trouble is that real life isn't like that. In our everyday life we have to make decisions – if I've only got 60 pence left I can't buy another pint.

We also choose between alternatives – if it's my round I'll have a half of bitter, if it's yours make it a double malt whisky.

To be any use our programs have to make decisions as well. Program II shows one way of doing this in Basic.

```
   10 REM Program II
   20 INPUT"Give me a number",number
   30 IF number=3 THEN PRINT "It's ";num
ber
```

Alright, so it's another rather trivial program, almost identical to Program I. Don't let appearances deceive you though, because it contains the seeds of some very powerul programs.

It allows you to make decisions, or rather, tell the micro when to make decisions and how to make them.

The first two lines should cause you no problems by now – if you've got this far you've almost certainly understood Program I, from which they're been taken.

The last line, line 30, introduces two new Basic keywords, the ones that allow the micro to take a decision. Yet despite the fact that they're new, I don't see many people having problems with them.

After all the last line reads like English. It's obvious that if *number* contains 3, then the program will display:

```
It's 3
```

What happens if *number* doesn't contain 3 but 4 or 2 or 121? Try it and see for yourself.

Unless you've got a version of Basic that differs radically from mine, you'll see that the number in *number* is only printed out if *number* contains 3.

BEGIN
HERE
Part
16

Otherwise that final PRINT is ignored and effectively line 30 does nothing. So the program does different things depending on the value in *number*.

In effect the program has made a choice, performing different actions depending on the input given to it.

Alright, so we've forced it to take a decision and we told it what to do, but the actual choice depended on what was happening when the program ran.

We don't know what *number* will be, so we don't know what will happen until it happens. The micro alters its course of action depending on the prevailing circumstances.

All this is done using Basic's IF...THEN structure which takes the form:

```
IF a condition is true THEN do something
```

What happens is that when the micro comes across an IF it realises that what comes next is a condition. In this case the condition is:

```
number=3
```

When *number* is equal to 3 then it's obvious that the condition has been met. This is known as the condition being true.

The program now goes on to do whatever action is specified after the THEN, in this case just printing a message.

Should the condition not be true – which happens whenever number is anything but 3, say 5 or '99 – then whatever comes after the THEN is ignored. No message is printed.

In effect the IF...THEN acts as a switch between two courses of action. IF the condition is true, THEN the following action is performed. IF it's false THEN, in effect, the whole line is ignored.

In Program II this means that when *number* is 3 the bit of line 30 after the THEN is performed. If *number* isn't equal to 3, then nothing happens.

Try changing the condition in Program II to:

```
number=7
```

or:

```
number=-3
```

and see what this does to the program's behaviour.

While in this example the IF...THEN is performing a fairly trivial task it would hardly be an exaggeration to say that the IF...THEN construct is one of the most powerful features in Basic.

All non-trivial programs have them. Program III gives a flavour of how they are used.

```
  10 REM Program III
  20 PRINT "Option one - 1"
  30 PRINT "Option two - 2"
  40 PRINT
  50 INPUT "Choose an option "choice
  60 IF choice=1 THEN PRINT "You picked
option one"
  70 IF choice=2 THEN PRINT "You picked
option two"
```

Here lines 20 to 50 have you choosing between two options and storing the result in *choice*. This is then used in lines 60 and 70 to decide which message is printed.

It doesn't take much imagination to see that instead of giving a message the code after the THEN could do all sorts of things.

One choice could send the program off to calculate a single person's tax code, the other to calculate a married man's allowance. Or one choice could give you another game while the other

Turn to Page 102 ▶

◀ *From Page 101*

brings it to an end or shows the high score table.

Anywhere that either you or the program has a choice, there's an IF...THEN lurking. And as we'll see in the next couple of months, IF...THEN is an extremely powerful structure.

As an intellectual exercise, can you spot the differences in the meaning of:

```
number=3
```

in:

```
30 number=3
```

and:

```
30 IF number=3 THEN ...
```

In the first case the value 3 is assigned to the variable *number*.

In the second the IF has the micro checking to see if *number* contains the value 3. It might be clearer if you remember that:

```
number=3
```

is short for:

```
LET number=3
```

In the case of the IF, the equals sign is being used as what is known as a comparative operator. It asks for a comparison to be made between two things, the comparison being true if they're both the same.

=	equal
<>	not equal
<	less than
>	greater than
<=	less than or equal
>=	greater than or equal

Table I

We're not just stuck to the equals sign, we can make other comparisons using the operators shown in Table I.

I won't go into them in detail, I'll leave it to you to experiment with them and see what they do.

Program IV shows the "not equal" operator in action. Here the message is only printed if *number* is not equal to 3, the exact opposite of Program II.

```
   10 REM Program IV
   20 INPUT "Give me a number " number
   30 IF number<>3 THEN PRINT "You didn'
t pick 3"
```

Once you've figured out how that works and tried using some of the other operators, take a look at Program V, the last program this month.

```
   10 REM Program V
   20 INPUT "Give me a number " number
   30 IF number<>3 THEN PRINT "You didn'
t pick 3"
   40 IF number=3 THEN PRINT "You picked
 3"
```

This contains our old friend *number* and two IF statements. The first checks if *number* is anything but 3 and tells you. If *number* is 3 it tells you that as well.

Whatever happens one of the two IFs is true, so one of the messages appears.

This is rather different from Programs II and IV when the program simply halted if the condition was true. Now all the alternatives are catered for.

Try using the other comparative operators in Program V and see what happens when they are combined.

● *That will give you enough to keep you busy until next month, when we'll be taking some more decisions. What else?*

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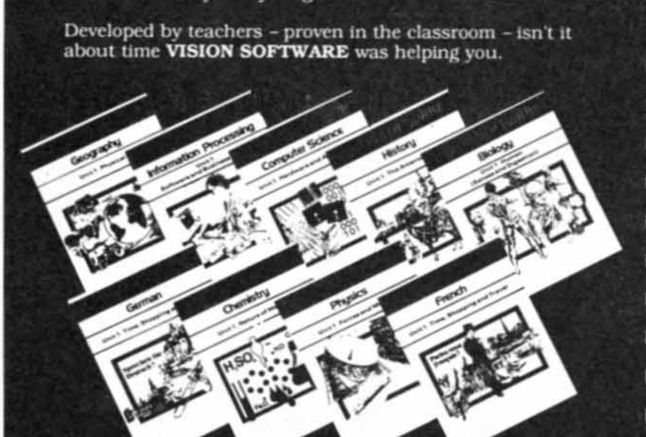

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PD853 Combo Dual 5.25"/3.5" drive with psu.	**£229 (a)**

DISC DRIVE MULTIPLEXER

Full specification on page 6.

TDM2 Dual Unit: 2 computers/one drive unit	**£75 (b)**
TDM4 Quad Unit: 4 computers/one drive unit	**£135 (b)**

3M FLOPPY DISCS

See page 10 for details of Special Offer

5.25" Discs in packs of 10	
744 40T SS DD	**£10.00 (d)**
745 40T DS DD	**£12.00 (d)**
746 80T SS DD	**£14.50 (d)**
747 80T DS DD	**£15.50 (d)**

(Add £1 for library case packing)

3.5" Discs in packs of 10	
80T SS DD	**£20 (d)**
80T DS DD	**£25 (d)**

BULK DISCS

High quality unlabelled discs supplied in packs of 50 in a storage box. The 5.25" discs have the reinforcing hub rings. These discs are guaranteed for life.

50 5.25" 40 T single sided discs in lockable box.	**£35 (b)**
50 5.25" 80T double sided discs in lockable box.	**£45 (b)**
50 3.5" 80T double sided discs in lockable box.	**£95 (b)**
FLOPPICLENE DRIVE HEAD CLEANING KIT	
5.25" Kit with 20 disposable discs	**£12.50 (d)**
3.5" Kit with 20 disposable discs	**£14.00 (d)**
DISC STORAGE BOXES	
DB340 Lockable 40 x 3.5"	**£8.50 (c)**
DB550 Lockable 50 x 5.25"	**£9.00 (c)**
DB570 Lockable 70 x 5.25"	**£11.00 (c)**
DB5100 Lockable 100 x 5.25"	**£13.00 (c)**

MONITORS

BBC lead incl with all monitors

MICROVITEC 14" RGB Monitors Please specify plastic or metal case.	
Microvitec 1431 Standard Resolution 453 pixels	**£179 (a)**
Microvitec 1431AP As 1431 + composite video and sound input	**£199 (a)**
Microvitec 1451 Medium Resolution 653 pixels	**£225 (a)**
Microvitec 1451AP As 1451 + composite video and sound input	**£259 (a)**
Microvitec 1441 High Resolution 895 pixels	**£365 (a)**
Microvitec 20" RGB/PAL/ Audio Monitors	
Microvitec 2030CS Standard Resolution RGB/Comp Video	**£380 (a)**
Microvitec 2040CS High Resolution RGB/Comp Video	**£685 (a)**
TOUCHTEC-501 Brings genuine touch screen operation on metal cased Microvitec monitors, incl utilities disc with starter and development programs	**£239 (b)**
PHILIPS 8501 See page 10 for details.	**£139 (a)**
TAXAN SUPER VISION 620 12" Hi Res/Hi Contrast Option to switch to green/amber BBC/IBM Compatible	**£279 (a)**
TAXAN SUPER VISION III 12" Super Hi Res and contrast RGB Monitor with option to switch to mono BBC/IBM compatible.	**£319 (a)**
MITSUBISHI XC1404 14" Med Res RGB Monitor Etched dark screen brilliance and contrast control, BBC/IBM compatible	**£219 (a)**
12" MONOCHROME MONITORS	
TAXAN KX1201G Hi Res green etched screen	**£85 (a)**
TAXAN KX1202G Hi Res Long Persistence (P39)	**£95 (a)**
TAXAN KX1203A Hi Res amber etched screen	**£95 (a)**
PHILIPS BM 7502 Hi Res green screen	**£75 (a)**
PHILIPS BM7522 Hi Res amber screen	**£75 (a)**
MONITOR ACCESSORIES	
Microvitec Swivel Base (14" plastic monitors)	**£20 (c)**
Philips Swivel Base	**£14 (c)**
Monitor Stand Models B & B+	**£10 (c)**
Monitor Stand Master	**£13 (c)**
Double Tier stand Models B, B+ or Master	**£24 (b)**
Taxan RGB Lead	**£5 (d)**
Microvitec Lead	**£3.50 (d)**
Monochrome BNC/Phono Lead	**£3.50 (d)**

EPROMS/RAMS

2764-25	**£2.50 (d)**
27128-25	**£2.75 (d)**
6264LP-15	**£2.80 (d)**

RAM/ROM EXPANSION

ATPL Board for Model B. Simple to instal, no soldering. Allows expansion to 15 Roms + 2 8K Rams	**£37 (c)**
ATPL Battery backup kit	**£16 (d)**
ATPL Board for BBC+ (now in stock).	**£31 (c)**
TIME WARP Real Time Clock. Plugs into the user port, battery back up as standard, includes manual, demo software including a diary/planner application program	**£31 (d)**
Time Warp with PANOS Utilities.	**£39 (d)**

MODEMS

(All modems are BABT approved)
See page 7 for modem specifications

MIRACLE WS2000V21/23 & BELL stds	**£95 (c)**
WS2000 Auto Dial Card	**£27 (d)**
WS2000 Auto Answer Card	**£27 (d)**
WS2000 SK1 Kit	**£5 (d)**
WS2000 DS1 disc	**£10 (d)**
WS2000 Data Cable for BBC	**£6 (d)**
MIRACLE WS4000 V21/23	**£149 (b)**
MIRACLE WS3000 V21/23	**£295 (b)**
MIRACLE WS3000 V22	**£495 (b)**
MIRACLE WS3000 V22 bis	**£650 (b)**
WS3022 1200/1200 fd	**£395 (b)**
WS3024 2400/2400 fd	**£570 (b)**
BBC Data Cable for WS3000/4000	**£7 (d)**

PROGRAMMINGS ACCESSORIES/SOFTWARE

See page 8 for detailed specification

Compatible with B, B+ and Master

EPROMER II while stocks last.	**£89 (b)**
Eprom Ryter (Epromer III) See page 8 for details.	**Approx £119 (b)**
MPROMER	**£49 (c)**
META ASSEMBLER	**£145 (b)**
PORTAL EPROM EMULATOR 128K	**£185 (b)**
PORTAL EPROM EMULATOR 512K	**£285 (b)**
TEAM Disassembler	**£145 (b)**
EPROM ERASERS	
UV1B 6 eproms, safety cutout	**£47 (b)**
UV1T 6 eproms, timer, safety cutout	**£59 (b)**

TECHNOMATIC

BBC COMPUTERS & ECONET CENTRE

17 Burnley Road, London NW10 1ED Tel: 01-208 1177
305 Edgware Road, London W2 Tel: 01-723 0233

CAD/DRAWING PACKAGES

NovaCad Cad Package for B, B+ MASTER & Compact. (See page 9 for specification)

Tracker Ball/Mouse Version (TM)	£79 (d)
TM Version plus Tracker Ball	£119 (c)
TM Version plus Mouse	£105 (c)
Plotter Driver Generator	£25 (d)
MOUSE **AMX MOUSE with SUPER ART** (pse specify B, B+ or Master)	£63 (d)
Super Art	£43 (d)
PAGEMAKER	£39 (d)
MAX	£17.35 (d)
RB2 TRACKER BALL RB2 Tracker Ball with Icon Master (for B, B+ & Master)	£59 (c)
RB2 Tracker Ball with Cursor Control Rom (for Master only)	£59 (c)
RB2 Tracker Ball 'Stand Alone' for use with NOVACAD & other software)	£47 (c)
Cursor Control Rom for Master	£12.50 (d)
MIRRORSOFT FLEET STREET EDITOR incl VAT	£39.50 (d)

CP/M SOFTWARE

for Acorn, Torch & Multiform Z80 Processors

MICROPRO's Wordstar Professional	£310 (a)
ASHTON TATE's DBASE II	£310 (a)
SUPERCALC II	£195 (a)

Send for details on our full range of CP/M & PC DOS packages for Business, Communications & High Level Languages.

BBC SOFT/FIRMWARE

DATABASE MANAGEMENT SYSTEMS

VIEWSTORE Acorn's database with display in any mode in spreadsheet or user defined card format and powerful sort facilities. Max file size 4Mb	£37 (d)
STARdataBASE A fast machine code, true random access database. Upto 4000 records/file, 69 fields. Fully menu driven, user defined record layout, very fast searches thru keysearch facility. Mailmerging from VIEW and WW.	£49 (d)
MASTERFILE II Highly popular economically priced database. 17 fields per record, file size limited by drive capacity only. (40T or 80T) Please state DFS or ADFS.	£17 (d)

WORD PROCESSORS

VIEW 2.1	£37 (d)
VIEW 3.0	£56 (c)
VIEW INDEX	£12 (d)
VIEW PRINTER DRIVER GENERATOR	£9 (d)
DOT PRINT PLUS Full details on page 5 NLQ rom for Epson FX/RX, MX and GLP.	£28 (d)
WORDWISE	£24 (d)
WORDWISE PLUS	£38 (d)
WYSIWYG PLUS See page 7 for details.	£21 (d)
INTERWORD (If you own a WW+ then quote your reg number and pay £39).	£46 (d)
SPELLMASTER	£49 (d)
WORDEASE A 16K rom based utility for WW+	£24 (d)
SPELLCHECK III A 16K rom based spellcheck program for View and WW. Contains 2000 words on the rom and 6000 (expandable to 17000) words on a disc.	£31 (d)
EDWORD II (Please specify model B, B+, Compact or Master).	£43 (c)
EDWORD II Applications package	£27 (c)

SPREADSHEETS

VIEWSHEET Acorn's spreadsheet provides 255 cols and 255 rows and will operate in any mode. Fully compatible with VIEW and 6502 2nd processor.	£37 (d)
WINDOMATIC Enhances the power of Viewsheet See page 9 for details.	£15 (d)
VIEWPLOT A disc based plotting program. (To be released soon).	£22 (d)
INTERSHEET The new spreadsheet from Computer Concepts with many advanced features like 105 col mode, holding several spreadsheets in memory at a time etc.	£39 (d)
INTERCHART Graphics package for Intersheet	£27 (d)
ULTRACALC BBC Publications very popular and well proven spreadsheet rom includes graphics utility disc.	£52 (d)
MINI OFFICE II (for BBC B) A suite of inexpensive but extensive word processor, database and spreadsheet packages. (40T or 80T)	£14.75(d)
MINI OFFICE II (Rom)	£48 (d)

LANGUAGES

META ASSEMBLER Multi processor Assembler full details on page 8	
TEAM DISASSEMBLER	£145 (b)
MACROM A very fast full featured macro assembler rom from 6502 and 65C02 codes, allows use of macros from library disc. Assembly can be disc to memory, memory to memory, memory to disc and disc to disc thus allowing very long source code upto the length of disc in use. About 3 times as fast as ADE and 30% more economical in memory.	£33 (d)
ACORN MICRO PROLOG Logic programming language used extensively in the artificial intelligence field. A simple 'front end' is supplied to make syntax more friendly.	£62 (d)
ISO-PASCAL Acorn's full implementation of International Std Pascal on 2x16K roms.	£48 (c)
ISO PASCAL STAND ALONE GENERATOR	£30 (d)
OXFORD PASCAL A fast P-code compiler and stand alone utility (40 or 80 T) Specify B or B+.	£36 (d)
OXFORD PASCAL for Master	£52 (d)
BCPL	£46 (c)
BCPL CALCULATIONS Supports floating point, fixed point and fast integer calculations on BCPL	£17.50 (d)
BCPL STAND ALONE GENERATOR	£39 (d)
ACORN LOGO	£46 (c)
LOGOTRON LOGO	£55 (c)
BBC PUBLICATIONS OPEN LOGO	£59 (c)
ACORN LISP ROM	£39 (d)
ACORN FORTH ROM	£39 (d)
ACORN COMAL ROM	£43 (d)
MICROTEXT A frame based authoring system from NPL for interactive computer tutoring. Disc based	£52 (c)
MICROTEXT PLUS Extended Features incl extra memory, control of external devices etc. Rom based.	£229 (b)

COMMUNICATIONS

TERMULATOR Advanced terminal emulator which includes VT52/100, Tektronics 4010, teletype emulations.	£25 (d)
COMMSTAR A highly popular communication rom suitable for all general purpose applications (specify B or Master)	£28 (d)
COMMUNICATOR A full 80 col VT100 emulation program with easy to follow screen menus.	£49 (d)
DATABEEB A variety of facilities for use with WS2000 Modem	£26 (d)
COMMAND (specify the modem type)	£34 (d)

COMPACT
(all on 3½" disc)

ARTROOM	£27 (d)
FONTWISE+	£22 (d)
FONT EDITOR	£22 (d)
RAMROD	£37 (d)
BROM PLUS	£32 (d)
MACROM	£37 (d)
BETABASE	£27 (d)

UTILITIES

ACCELERATOR	£49 (d)
ACORN BASIC EDITOR	£22 (d)
MONITOR (BBC Pub)	£34 (a)
BROM PLUS	£26.50 (d;
SLEUTH	£23 (d)
TOOLKIT PLUS	£31 (d)
TOOLBOX 2 (BBC Pub) Manual Cassette	£9.50 (d) £9 (d)
EXMON II	£23 (d)
HELP II	£25 (d)
ACORN GXR GRAPHICS ROM specify B or B+	£22 (d)
PRINTMASTER	£24 (d)
PRINTWISE	£24 (d)
DUMPMASTER supports about 40 printers	£26 (d)
FONTWISE PLUS	£17 (d)
HERSHEY FONT CHARACTER GENERATOR	£18 (d)
ICON MASTER	£29 (d)
MOVIE MAKER Two Roms + Cassette	£26 (d)
ADV TELETEXT UTILITIES ROM	£7.95 (d)

TECHNOLINE
(24 hr viewdata system)
Tel:01-450 9764

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17 Burnley Road
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Telex:922800

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15 Burnley Road, London NW10 1ED
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using VISA/Acess Card

Orders welcome from
government depts &
educational establishments

All prices ex VAT.
Prices are subject to
change without notice
Please add carriage
(a) £8.00 (Datapost)
(b) £2.50
(c) £1.50
(d) £1.00

BBC PUBLICATIONS EDUCATIONAL SOFTWARE

A series of programs developed in many cases alongside Radio & TV programmes by BBC's Education Department which supplement the classroom studies by moving and colourful displays helping in clear understanding of a variety of subjects. Some packages also include audio cassettes.

PRIMARY EDUCATION

ASTRONOMY:
9-12 years. Phases of moon, eclipses, seasons etc. Includes a game. **Disc £11 (d)**

COMPUTERS AT WORK:
The Work Game illustrates two of the most important computer applications: Robotics & IT. Incl. a database prog, word processing tutorial and a robotic control prog. **Aud/EC/disc £16 (c)**

PICTURE CRAFT
An inexhaustible, versatile and flexible suite of programs to design shapes & patterns, paint them and convert them into pictures, puzzles and games. **Disc £17 (d)**

INTRODUCING GEOGRAPHY
9-13 years. Four exciting graphical adventures include river navigation, flying, mountain climbing and desert crossing. **Disc £16 (d)**

MATHS WITH A STORY 1
Four primary level programs incl symmetry, co-ordinates and probability for children of wide ranging abilities. **Cass £8 (d)**

MATHS WITH A STORY 2
Similar programs as 1 but covered from a different angle. **Cass £8 (d)**

NUMBER GAMES:
6 programs designed to stimulate the mind of an active child of 8 years and upward. **Cass/EC £7.50(d)**

USING YOUR COMPUTER
8/12 years. Introduction to computers using synchronised audio techniques. Total of 80mins of audio & 14 progs. **Cass £24 (c)**

WORD PLAY
An elegant but simple introduction to word processing using animal shapes for editing functions. Fun manual for the children. **Cass £10 (d)**

WORD MOVER
A simple text editor. **Cass £8 (d)**

SECONDARY LEARNING

ADVANCED LEVEL STUDIES: STATISTICS
6 progs covering central concepts and principles. Topics include Discrete Data & Binomial Distribution. Eont. Data & Normal Data Distribution. Hypothesis Testing & Confidence intervals, Central Limit theorem & Estimation, Simulations, Correlations and Regressions. **Disc £23 (d)**

ADVANCED STUDIES: GEOGRAPHY
4 progs covering social geography: Traffic & Town planning, drainage & basin management and planning for industry. **Cass £10 (d)**

INSIDE INFORMATION
Designed to introduce IT to young adults. Suitable for use in sec. schools, ITeCs & Adult Educ. Centres. **Prog Cass £10 (d)**
Audio Cass £5 (d)
Book £8 (d)

SCIENCE TOPICS (ST)

S.T.: WAVES
A Physics program allows display of waveforms and shows changes caused by different parameters. **Disc £14 (d)**

S.T.: RELATIONSHIPS
A Biology program giving a sophisticated simulation exercise based on data from W.H.O. **Disc £14 (d)**

S.T.: BONDING
A Chemistry program to reinforce & strengthen the concept of bonding of elements. Transfer and sharing of electrons are both shown graphically. **Disc £14 (d)**

S.T.: ELECTROMAGNETIC SPECTRUM
A graphical adventure prog to test your knowledge of the electromagnetic spectrum. **Disc £14 (d)**

S.T.: ELECTRONICS IN ACTION
Program about using computers for control. Control is achieved by using 6502 assy lang. Prog editor is supplied. **Disc £14 (d)**

S.T.: NEWTON & THE SHUTTLE
A interactive prog in 3 parts covering launch to recapture of a satellite to test the knowledge of Newtonian mech. **Disc £19 (d)**

S.T.: ECOLOGY
Simulation program managing a nature reserve to meet a host of individual needs. **Disc/EC £19 (d)**

S.T.: POLYMERS
Students run a manufacturing co. and have to choose best materials for their products and compete with a rival co. run by the computer. **Disc/EC £19 (d)**

S.T.: CLASSIFICATION & PERIODIC TABLE
A database program for producing different classifications of chemical information and presented in any format. **Disc £20 (d)**

S.T.: FOOD & POPULATION
Simulation in space of biological aspects of nutrition and food production logistics. **Disc £20 (d)**

SEC. SCIENCE: MICROTECHNOLOGY
Fundamental concepts of electronics Logic & Resistor Tutors, Servo Cct simulation & a cct design program. **Cass £7 (d)**

SEC. SCIENCE: THE MOLE CONCEPT
A computer sync. audio program explains definitions of atomic & molecular masses and depicts molar equations. **Disc/Aud/EC £16 (c)**

SEC. SC.: UNIFORMLY ACCELERATED MOTION:
Illustrates basic eqns., uniform accln, under gravity and an idea of terminal velocity. **Disc/AUD/EC £16 (d)**

VU-TYPE
The popular 'Sight & Sound' touch typing tutor with alterable settings. **Disc/EC £15 (d)**

GENERAL

VU TYPE PROFESSIONAL
An enhanced and expanded version of Vu Type with 63 Pitman approved exercise. **Disc £19 (d)**

WHITE KNIGHT MK II **Disc £16 (d)**
(Specify it for Master).

BATTLEFIELDS **Cass £8.50 (d)**

A VOUS LA FRANCE
A home study aid for anyone learning French. **Cass/EC £17 (d)**
Book £5.25 (d)

DEUTSCH DIREKT
Disc based vocabulary learning prog with audio cassette to help with pronounciation. **Disc/aud/EC £16 (c)**
Book £5.95 (d)

MODEM MASTER **£POA**

Cassette based programs listed above can be supplied on disc at an extra charge of £1.50 per disc and please specify the format required 40 or 80T.

PRINTER ACCESSORIES

EPSON ACCESSORIES:
Interfaces:

8143 RS232	£28 (d)
8148 + RS232 + 2K	£57 (d)
8148 + RS232 + 8K	£65 (d)
8165 IEEE + Cable	£65 (d)
8132 Apple II	£60 (d)
8177P NLQ for FX80 + /FX100 +	£99 (d)

Parallel & Serial Buffers of various size also available.

FX80/80 + /85 Tractor Attachment	£27 (c)
LX80/86 Tractor Feed	£20 (d)
LQ800 Tractor Feed	£44 (b)
LQ1000 Tractor Feed	£49 (b)
EX800/1000 Colour option	£55 (b)
HI80 HP GL Emulation Rom + Ram	£59 (c)
HI80 Printer Emulation Rom	£35 (c)

SHEET FEEDERS:

8338 LX80	£49 (b)
8333 FX100 + /105	£169 (a)
8331 FX80 + /85	£129 (b)
LQ800	£129 (b)
LQ1000	£159 (b)
EX800	£129 (b)
EX 1000	£289 (b)
FX 800	£129 (b)
FX 1000	£169 (b)

Ribbons:

RX/FX100/100 + . FX105	£7 (d)
RX/FX80/80 + , FX85	£4 (d)
LX80	£4.50 (d)
LQ800	£8.50 (d)
LQ1000	£10 (d)
LQ1000	£10 (d)
EX800/1000	£7.50 (d)
H180 Pen Set (Aqueous/Ball point)	£7.50 (d)

Dust Covers:

FX80	£5.50 (d)
TAXAN/Canon KP810	£6 (d)
FX100 £7.50 (d)	**KP910** £7 (d)

HITACHI 672 Plotter

Aqueous Pen Set six pens	£18.50 (d)
Oil Based Pen Set six pens	£25.00 (d)

TAXAN CANON Accessories:

RS232 + 2K interface	£63 (d)
Ribbon. KP 810/815/910/915	£6 (d)

Star Printer

NL10 Sheet Feeder	£52 (b)
NL10 RS232 Interface	£69 (c)
NL10 IBM Type Interface	£39 (c)
NL10 Ribbon	£4.50 (d)

National Panasonic KX P1080

Spare Ribbon	£4.50 (d)
Serial Interface	£39 (c)

JUKI 6100

RS232 Interfaces	£65 (d)
Tractor Feed	£149 (a)
Ribbon (Carbon)	£2.00 (d)
Spare Daisy Wheel	£14 (d)
Sheet Feeder	£182 (a)

BROTHER HR20

Daisy Wheel	£18 (d)
Tractor Feed	£116 (a)
Spare Ribbon Nylon	£3.00 (d)
Spare Ribbon Carbon	£4.50 (d)

INTEGREX INK JET COLOUR PRINTER

Spare Ink Cartridge Black	£9 (d)
Spare Ink Cartridge Colour	£15 (d)
Paper Roll	£7 (d)

Printer Leads:

BBC Parallel Lead (1.2m)	£6 (d)
BBC Serial (Epson) Lead (1.2m)	£7 (d)

Other lengths can be supplied on order:

IBM Parallel Lead (2m)	£12 (d)

PAPER & LABELS
Plain Fanfold paper with micro perforations:

2000 sheets 91/2" × 11" 60gms/sq m	£12 (£3)
2000 sheets 141/2" × 11" 60gms/sq m	£18.50 (4.50)
1000 sheets A4 90gms/sq m	£12 (b)

Labels/1000:

Single Row 3½ × 1 7/16"	£5.25 (d)
Triple Row 27/16" × 17/16"	£5 (d)

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ACW443 CAMBRIDGE WORKSTATION

A complete self-contained workstation with:.

- NS32016 8MHz Main Processor & 32081 FP processor.
- 20 Mbyte Winchester and one 80T Ds floppy drive.
- A detachable keyboard Hi Res RGB Monitor.
- 4Mbyte of on board Ram as standard.
- Languages supplied include: Fortran 77, Pascal, C, Cambridge LISP, 32016 Assembler & 32bit BASIC.
- Utilities on the operating system to cross link programs between different languages, utilities for porting programs to mainframes.
- **Phone for detailed leaflet.**

32016 CO-PROCESSOR

A second processor that brings genuine 'Mainframe' power to the BBC Computer.

- Interfaces with the BBC through the tube connector.
- NS32016 6MHz CPU & 32081 FP processor.
- 1Mbyte Ram as standard.
- Packaged software includes all the languages and utilities supplied with the ACW Work Station.
- **Phone for detailed leaflet.**

CPU/FP Upgrade Kit (Acorn recommended) for the Co processor for 10 Mhz operation to enable faster processing. It can be fitted at no extra charge if ordered with the Co Processor.

TIME WARP Real Time Clock with PANOS utility allows screen display of time, day and date within PANOS at anytime and allows these data to be printed on documents. Model B users will find this particularly useful.

512 CO-PROCESSOR

Brings professional software to the BBC Master.

- 10 Mhz 80186 *DOS PLUS.
- GEM Write & GEM Draw.
- 'WIMP' Environment with high quality Mouse.
- Runs many 'IBM' programs — even 'Flight Simulator'!
- Convert to/from IBM/BBC data.

DOTPRINT PLUS

A uniquely versatile NLQ ROM for the BBC Micro.

- Built-in character font generator.
- Built-in view printer driver.
- Supports microspacing for professional justification in View & with disc in Wordwise/Plus.
- True bold print as well as double width.
- 12 character pitch as standard.
- Fully variable pitch and line spacing.
- Suitable for fully **'EPSON'** compatible printers with quad-density graphics.
- **DOTPRINT PLUS** for EPSON FX/RX and compatibles.
- **DOTPRINT DUAL** for EPSON MX range.

MICROJUSTIFIED TEXT

homes of a ruling class whose right to
rule was based on the ownership of
land. Large estates produced money;
perhaps even more important, they
supplied people to fight for their

NORMALLY JUSTIFIED TEXT

homes of a ruling class whose right to
rule was based on the ownership of
land. Large estates produced money;
perhaps even more important, they
supplied people to fight for their

Notice how MICROJUSTIFICATION eliminates 'stretched' spaces between words.

FREE BUNDLED SOFTWARE WITH THE BBC MASTER

Authorised dealer for
"Advanced Interactive Video System"
Please send for details on the equipment and subsidies available to schools

We now supply the Master 128K Computer with educational software which enables immediate use of the computer.

The software package includes:

VU-TYPE DISC
The popular 'sight and sound' touch-typing tutor using colour graphics.

WORDMOVER
A program to help develop the vocabulary of primary school children

WORD PLAY
An elegant and simple program to introduce primary school children to the concept of word processing.

DRAWSTICK
A simple drawing program

LOCO MOTION
An animated game giving the player control of a train travelling around a network of some 50 screens.

PANTRY ANTICS
A fast, amusing and exciting arcade game.

EPSON PRINTERS

Epson have launched a new series of printers to update the FX range. The new **FX800** and **FX1000** range combines printing versatility and superior technical features with the highest standards of reliability. The features include two NLQ fonts, 10, 12, 17, and 20 cpi, dble ht and dble width, 200 cps in draft and 40 cps in NLQ, tractor and friction as standard, IBM compatible, full graphics, 8K buffer, Parallel interface.

EPSON EX8000/1000
This range offers high speed printing to offer versatility in volume printing with speeds of 300 cps in 12 cpi mode. Four colour printing option is available for these printers.

EPSON LQ800/1000
This range with its 24 pin print head offers the highest standards in letter quality printing at high speeds while maintaining the versatility of dot matrix printers. The hex density graphics capability produces about the best printout any dot matrix printer can produce.

STAR NL10

A 80 col 120 cps printer with fine NLQ at 30 cps offers novel and innovative features. There are no dip switches to set, full control from the front console. Plug in interface cartridge simplifies adaptation to different computers. Friction & Tractor feed as standards. Epson Compatible Graphics.

NATIONAL PANASONIC KXP1080

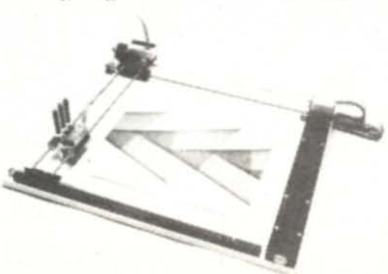
A high performance low cost printer with full character pitch feature 10, 12, 15 & 17 cpi and proportional spacing in both draft and NLQ mode. 80 column, 100 cps draft and 20 cps in NLQ. Parallel interface and Friction and Tractor feeds as standard. Epson Compatible Graphics.

HITACHI 672

- A3 four colour precision plotter.
- Serial and parallel ports as standard.
- Produces 'OHP' transparencies as well as plain paper.
- 'HP' graphics language or single character commands.

GRAPHICS WORKSTATION

A A3 pen plotter with 0.1mm resolution allows graphs, charts, architectural drawings to be plotted using the 9 predefined plotting instructions or by using a CAD package. The pen mount allows a variety of pen types including drawing pens to be used or the following range of accessories to be fitted.



OPTICAL SENSOR

This converts the plotter into a input device and offers a new range of applications: Scan or digitise a picture or a drawing to display or store. Traverse mazes and investigate methods of artificial intelligence. Reliably read bar codes.

DRILL/ROUTER

This will drill holes, machine moulds and cut complex 3-D shapes in a range of suitable materials to a depth of 16mm. Driver software is supplied on disc and an optional application program is available to interface the drill/router to our NOVACAD package.

SCRIBER

The sharp pointed scriber may be used to etch fine line drawings on surfaces such as scraperboard, wax coated copper etc. Full details on request. See page 1 for price.

All accessories available separately if required.

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(24 hr viewdata system)
Tel:01-450 9764

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(b) £2.50
(c) £1.50
(d) £1.00

TS 400

PD 800

PD 800 P

P2041 HT

DISC DRIVES

TECHNOMATIC offers a wide combination of high quality, high performance drives to meet all needs of BBC micro users. Please see our detailed and competitive price list on page 2.

*** All Technomatic drives are fitted with quality slim line ultra low power mechanisms capable of single and double density operation and offering very fast track access and head settling times.**

*5.25″ floppy drives are fitted with 40/80 track switches as standard at no extra cost. The switches are located in the front and clearly marked to indicate the status at a glance.

*The mechanisms are set inside attractively styled, sturdy metal casings painted in BBC beige colour.

*The plinth version drives provide for a neat and compact system installation giving it a more professional look.

*All drives fitted with all necessary leads and are ready for operation on unpacking. The drives with the mains power supply are supplied with a mains lead fitted with suitably fused 13A moulded plug.

*PD853 Combo drive includes a combination of 5¼″ (40/80T switchable) and a 3½″ 80 Track Double Sided mechanisms. Complete with mains p.s.u. Ideal for software conversion for 5½″ to 3½″ or vice versa.

Such is our faith in Mitsubishi mechanisms that we offer a two year warranty on our floppy drives

WINCHESTER DRIVES

Mass storage 20 Mbyte drives are available in the following versions:

* P20HD Stand alone.
* P204HP With a single floppy housed in a plinth version case.
* P214TS Top of the range with a 10 Mbyte back up streamer and a single floppy housed in a plinth type casing and supplied with backup utilities.
* TS10 A stand alone 10Mbyte streamer for those who are already equipped with a Winchester and a floppy drive. Utilities for backup can only be loaded from a floppy.

All models are fully compatible with Acorn's ADFS system and include a mains psu and the necessary cable connections.

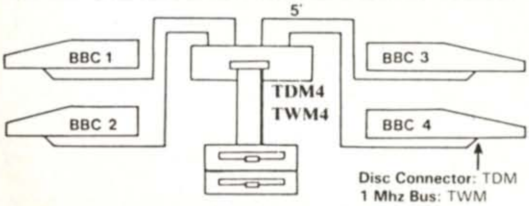
ALL TECHNOMATIC FLOPPY DRIVES NOW CARRY A TWO YEAR WARRANTY

FLOPPICLENE
Disc Drive Cleaning Kit

Floppiclene introduces a positive concept in ensuring continuous high performance of the disc drives by providing an easy and efficient method of keeping the drive heads clean. Use of disposable cleaning discs eliminates the risk always present in reuseable discs of recontamination and abrasion of the sensitive drive heads. Available for both 5.25″ and 3.5″ drives. Please see page 2 for prices.

DISC DRIVE MULTIPLEXER

The cost-effective alternative to networking! A self-contained unit that enables up to four computers to be connected to one single or dual disc drive. No hardware modifications – simply plugs into the computers drive port connectors. No ROMs or other software needed. All DFS commands work as normal. The switching of drives between computers is totally automatic and completely invisible to the user. This unit is ideal for installing in classrooms and other situations, where networking is not planned or necessary, or where costs must be kept low. In many cases software needs to be shared, although full networking complexity and cost is not needed. Several of these units can be connected in series to allow more computers to access the same drives, i.e. two quads connected together will allow 7 computers to share 1 drive. Units are supplied with 5′ of cable per outlet as standard. Mains powered.



TDM4/TWM4 Quad Unit (up to 4 computers)
TDM2/TWM2 Dual Unit (2 computers)

WINCHESTER DRIVE MULTIPLEXER

A unique addition to our hardware range that allows the sharing of a Winchester between a number of computers. The principle of operation is the same as our highly popular disc drive multiplexers and there is no need for any additional software or hardware modifications. The Multiplexers are available in two versions, a dual unit for two computers and a quad unit for four computers to share a Winchester. Multiplexers are particularly useful for accessing common software and transferring data. Care needs to be excercised for certain types of random access files.

TECHNOMATIC

BBC COMPUTERS & ECONET CENTRE
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MODEMS

MIRACLE WS4000

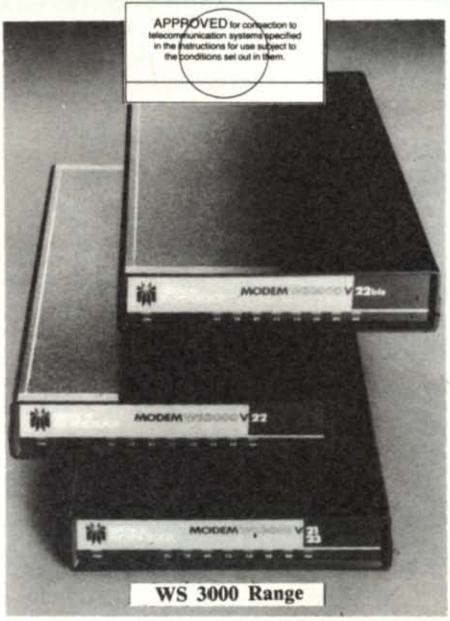
- A cost effective intelligent modem that offers the best value for money bringing the world of data communication within easy reach.
- Plain English commands make it simple to use, even for the first time user.
- Latest Hayes-type protocol commands, auto dial, auto answer, auto speed seeking.
- Equalisation model in V23 for line-noise filtering.
- Many other options including upgrading to V22 and V22 bis.

MIRACLE WS2000

- A comprehensive manually switched 'World Standard' modem.
- Competitively price with a capability to be upgraded for various options.
- BT approved for V21/V23, 300/300, 1200/75 and 1200/1200 half duplex.
- Includes BEL103/113/108 standards for use outside UK.

Optional extras include (Not BT approved).

- SK1 chip set for computer control.
- User port cable.
- Auto dial Board.
- Auto Answer Board.
- DS1 disc for auto dial facilities on Commstar.


APPROVED for connection to telecommunication systems specified in the instructions for use subject to the conditions set out in them.
MODEM V22bis
MODEM V22
MODEM V21 23

WS 3000 Range

Miracle have introduced two new models in the WS3000 series for users who require a modem for a specific use. Model WS3022 provides 1200/1200 baud full duplex operation whilst only WS3024 provides 2400/2400 baud fd only.

Please see page 2 for prices

MIRACLE WS3000 RANGE

- A professional range of intelligent modems with full BABT approval.
- Auto Answer and Auto Dial facilities installed as standard.
- HAYES protocols implemented.
- Pulse or DTMF 'tone' dialing.
- Plain English command structure simplifies the use of the modem.
- Integral parallel printer port fitted as standard configurable for both input and output for process control applications.
- A line sharing facility to differential between data and voice calls.
- Intelligent speed buffering converts 1200/1200 terminals to 1200/75
- Equalisation mode for line noise filtering.
- Internal battery back up for storing 63 names, numbers and default settings.
- Upgrade path for 1200/1200 and 2400/2400 and security encryption.
- Applications in the field of graphics and text access, high speed telex, user to user, and user to main frame.

SPECIFICATIONS

WS4000 V2123:	*CCITT V21/V23. *300/300, 600 and 1200 half duplex, 1200/75.
WS3000 V2123:	*CCITT V21/V23/Bell 103. 300/300, 600 and 1200/75
WS3000 V22:	*As V2123 and also 1200/1200 full duplex.
WS3000 V22 bis:	*As V22 and also 2400/2400.

MULTIFORM Z80

A unique Z80 2nd Processor with a 'MULTI FORMAT' capability.

includes a FREE Pocket Wordstar package

- Multiform Z80 will run most CP/M 2.2 formats on the BBC.
- 28 different formats including Acorn Z80, RML 380Z & 480Z, EPSON QX, Amstrad, Osborne etc, supplied on the library disc with the utility to create additional formats.
- Emulates the two of the most commonly used CP/M terminals, HAZELTINE 1500 and ADM-3a in addition to the Acorn VDU making installation of most of the software packages easy.
- Utility to inter convert ASCII text wordprocessed on a standard BBC and under OS/M or CP/M .
- 8271 allows single density CP/M formats whilst 1770 DFS allows both single and double density CP/M formats. Single or dual drive, 40 or 80 track format and SS or DS drives can be used providing the CP/M format matches.
- Dual drive will allow two separate formats to operate simultaneously for data transfer making it ideal for use in environment where machines with different formats are in use.
- Utility to read and write on IBM PC DOS discs available as an optional extra. Utility will also format a PC DOS disc.
- Multiform Z80 is supplied with a OS/M operating system rom, System disc and a Library disc. Please specify the DFS type and the drive format when ordering.

WYSIWYG PLUS

NEW

This new screen/printer utility not only allows you to see on the screen exactly how the text is going to appear on the paper when printed but also simplifies the printer control codes that you need to use to get the different effects.

WYSIWYG + can be used in BASIC or from within most popular word processors like View, Interword & Wordwise Plus.

The printer commands have been simplified to meaningful words so that the user does not have to either remember or keep referring to the printer manual and try to decode the commands to VDU format. For example: *ENGLARGED will display enlarged text on the screen and send the appropriate command to the printer to print in enlarged mode.

Some of the features you could see in WW + or from BASIC include:
*SUBSCRIPT, *SUPERSCRIPT, *ENLARGED, *BOLD, *EMPHASISED, *CONDENSED (up to 132 characters on screen), *PICA, *ELITE, *GRAPHICS (design your own logos and symbols), *UK, *FRENCH, *US, *TELETEXT (character sets), *BACKSPACE (for overprinting), *DOWNLOAD (new characters or fonts).

Simply plug in the WYSIWYG+ rom in your computer and utilise the features built in to your printer with ease and least bother to produce the results you know are possible but not so simple to achieve. No other single package offers this much flexibility and simplicity to get the best from your printer.

WYSIWYG+ rom is supplied with a comprehensive manual.

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(d) £1.00

EpromRyter
(Epromer III)
Eprom Programmer

An enhanced version of the highly successful **EPROMER II** providing added sophistication to the eprom programming applications on the BBC computer range. The new software also utilises the extra facilities of the BBC Master computer. The programming methods are 'state of the art' of programming technology for fast, efficient and cost effective operation.

The single rail eproms handled by the EpromRyter are:

- 2716 2732 2764 27128 27256 27512 27513 27011 2516 2532 2564 (NMOS & CMOS)
- One time eproms P27XXX, 87CXXX etc.
- Also A suffix eproms such as 27XXXA

The software is menu driven, many operations being single key. On screen help clarifying the operation being carried out. Will make the programming process very simple and easy for both specialists and novices alike.

The main features of the programming software are:

- Device, function and voltage selection from the computer keyboard.
- Continuous display of the options selected.
- All eproms upto 27512 (64K) programmed in single pass.
- Automatic Intelligent identifier support for eproms able to respond.
- Selectable programming voltage 25/21/12.5V
- 3 programming methods: Normal, Intelligent & Pulse (20 sec for a 27128).
- Serial port protocols supported.
- Intel HEX, Motorola S, HEX and ASCII protocols supported.
- DFS, NFS, ADFS and Rom Filing System Supported.
- BASIC/Machine Code programming using RFS.
- Powerful editor with input in HEX or ASCII. * Full editable 64K file.
- Block move of data within the address range.
- User can select any section of the eprom from single byte to the full address range to blank check/burn/verify. Facility to program single bytes makes program development/amendment simpler.
- Multiple loading for ROM Filing System

Some of the above features apply to Master Computers only

EpromRyter interfaces with the BBC through the 1 MHz bus, has a mains power supply and is fitted with a 3M TEXTOOL ZIF socket to provide consistent and reliable service for a long period.

META Version III

"All the good features you would expect to find in a good source code editor are present . . . Meta assembler lives in a different world. It is structured to work with any new processor . . . as new instruction sets can be added . . . as needed . . . has a well featured editor with colour highlighting, a sound modular approach."
Acorn User October 1986

- Assembles for over 30 popular processors, including Z80, 6800/01/02/04/05/09/11 etc — and 68000 — using native mnemonics for each processor, eg. LD A, (HL) for Z80 and MOV AO, $1000 for 68000 etc.
- Fully integrated Editor: four field, all search, search/replace, block copy, delete, move, marked save, load etc.
- Compatible with Portal Eprom Emulators and Team Disassemblers.
- Send object code in Intel Hex, S-Record, straight binary etc. down to discs, RS232, parallel port, Eprom Emulators etc — all **during Assembly.**
- Over 50 directives included as standard: handling nestable macros, conditional assembly and twenty types of table definition directives.
- 32 bit labels; 31 character names. Arithmetic and Boolean arithmetic to 32 bits.
- Modular source code with numeric and string parameter passing.
- Serial communicator area with eight options lines: echo, control code trap, LF supression/addition etc.
- Over 500 in use throughout the world in universities and many different industries.
- Two 16K Roms, two 80 track discs, A4 ring-band manual, function-key strip.

PORTAL EPROM EMULATORS

- Emulates 2716, 2732, 2764, 27128, 27256, 27512 eproms at 150ns Access time.
- Load at 4Kbytes/second — No "erase" time.
- 28 pin header plugs into Eprom socket on target system — status monitored on 13 Leds.
- Fully software controlled from Meta Assembler.
- 100 times faster than standard EPROM program/erase cycle.
- Fully CMOS compatible; draws no power from target system.
- Four portals may be independently programmed off same user-post cable.
- Complete with all cables, manual and disc.

PORTAL 128 (2716, 2732, 2764, 27128):
PORTAL 512 (2716, 2732, 2764, 27128, 27256, 27512).

MICROPROMER

An add on unit for Epromer II enabling the user to program 8741, 8748 and 8749 single chip microcontrollers. Now with the aid of cross assemblers such as META, the user can write code for the above devices and then with the aid of Micropromer program the device.

- Simple menu structure with on screen help. i.e. select a function and on the screen will appear details of the function being performed.
- Comprehensive error reporting and checking.
- Read, verify, blank check, program from 1 to the maximum byte count for the device being used at any address location.
- Support for DFS, ADFS and cassette filing systems.
- Edit data in Hex or ASCII.
- Total control via software, no switches to worry about.
- Supplied with user manual and software on diskette.
- MPROMER simply plugs into the EPROMER II ZIF socket.

TEAM DISSASSEMBLER

The third part of the Universal Development System: a Meta labelling dissassembler.

Supports 1802, 8080, 8085, HD64180, Z80, 65XX (includes 65 col, 6511 etc), 68XX (includes 00, 01, 02, 03, 08 etc): updates soon for most of Meta processors.

- Up to 64K of object code translated back into META compatible source code modules: labels automatically inserted on all jump targets, memory references etc.
- Pre-editing stage allows marking of object code areas as byte, string, word, long word etc, tables. These areas dis-assembled into appropriate directives instead of garbage mnemonics.
- Reconstituted source code ready for immediate re-assembly by META.
- Omniversal search/replace for re-naming arbitary label names with meaningful ones.

BOOKS

No VAT Carriage Code (c)

LANGUAGES	
6502 Assy Lang Prog	£19.95
6502 Programming	£13.95
8086 Book	£23.95
Acorn BCPL User Guide	£15.00
Acorn FORTH	£7.50
Acorn LISP	£7.50
Acorn ISO Pascal Ref Manual	£10.00
Intro to COMAL	£10.00
Intro to LOGO	£7.50
Micro Prolog Ref Manual	£10.00
Introduction to Turbo Pascal	£14.95
Prog the Micro with Pascal	£8.50
The Supervisor's BBC Micro	£10.95
The UNIX Book	£7.50
Unix User Guide	£19.95
Understanding Unix	£18.45
BBC MICRO GUIDE BOOKS	
BBC User Guide Acorn	£15.00
BBC Plus User Guide	£15.00
Drawing your Own BBC Programs	£6.95
Inside Information	£8.95
Math Prog in BBC Basic	£7.95
The Friendly Computer Book	£4.50
Toolbox 2	£10.95
VIA 6522 Book	£4.50
PROGRAMMING UTILITY	
Advanced Sideways Ram User Guide	£9.95
Advanced User Guide (BBC)	£15.95
Advanced User Guide	£12.50
Applied Assembly Language on the BBC	£9.95
BBC Micro Advanced Programming	£9.95
BBC Micro Ref Guide (B Smith)	£10.95
BBC Micro Sideways ROM's RAM's	£9.95
Guide to the BBC ROM	£9.95
Beginners Guide to W.P	£7.95
Mastering Assembly Code	£8.95
Mastering Interpreters & Compilers	£14.95
View 3.0 User Guide	£10.00
Viewstore	£10.00
Viewsheet	£10.00
Wordwise Plus	£9.95
SOUND & GRAPHICS:	
Computer Graphics & CAD Fundementals	£9.95
Mastering Music	£6.95
DISC DRIVE SYSTEMS:	
Advanced Disc User Guide	£16.95
Disc Book	£3.50
Disc Programming Techniques	£7.95
Disc Systems	£6.95
File Handling on the BBC	£6.95
Discovering Disc Drives	£POA
Practical Disc File Techniques	£5.95
Mastering the Disc Drive	£7.95
APPLICATIONS:	
Interfacing Proj for BBC	£6.95
BBC and Small Business	£5.75
The Software Business	£5.50

TECHNOMATIC

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NOVACAD

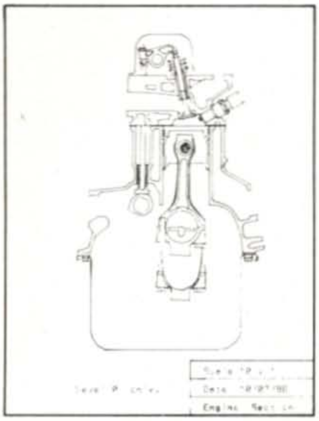
Computer Aided Draughting for the BBC Micro

> *" Novacad can drive a plotter to provide drawings of a high quality... Novacad is excellent. It is flexible, genuinely easy to operate without much practice, and a pleasure to use. "* **Beebug December 1986**

> *" Novacad is a professional package, well worth the £90 for the ROM and disc and is expandable to suit your own particular requirements. I would have no reservations if I heard Novacad called, "the best on the market". "* **A&B Computing August 1986**

A sophisticated CAD package with unique facilities which are generally confined to the professional CAD packages costing thousands of pounds.

NOVACAD is being used in widely differing fields ranging from leading British industries for producing engineering drawings to Accountants' offices for producing flow charts. Architects, engineers, plumbers, kitchen planners and many other professions requiring easy to use facilities for producing professional quality output are making extensive use of NOVACAD's unique features. NOVACAD is proving to be a invaluable teaching aid in technical schools and colleges simply because of the ease with which it can be used.



MINIMUM HARDWARE REQUIREMENTS

- **Any BBC range computer with Acorn DFS.**
- **40 Track single sided single drive.**
- **Epson compatible dot matrix printer.**

With basic BBC B, NOVACAD operates in mode 4 allowing use of any 2 colours. With shadow memory of the BBC + or the Master, it can also operate in mode 0 for higher resolution or mode 1 for allowing use of any 4 colours, and it will provide additional user memory for more complex drawings.

6502 second processor or the Turbo on the Master will also increase the drawing speed considerably.

The major features of NOVACAD are:

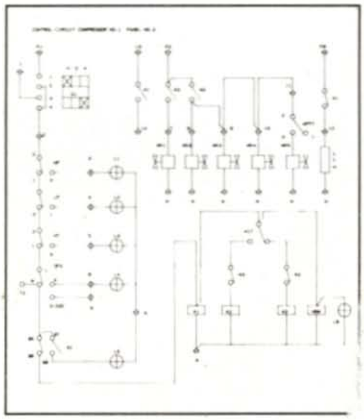
- Simple and easy to use with logical command sequence.
- A large drawing area (approx 15 screens).
- The ability to create complex icons (upto 500 lines instead of the usual 15 to 20 pixels), store them in a library and recall them at different scales and orientations.
- A zoom facility allowing magnification of up to 20 times to insert finer details.
- Block copy of shapes on the screen for repetitive use.
- Text entry at any 90° orientation at any position on the screen.
- Create multi layer drawing with 8 levels available.
- Full compatibility with the BBC range with minimal hardware requirements yet having the capability of exploiting the potential of the extra shadow memory or the second processor's memory and speed.
- Printer routine for Epson 80 and 136 column printers.
- A unique optional facility to output to any BBC compatible plotter.

NOVACAD

is available in two versions

*BASIC version for cursor control from the keyboard.

*T/M version for cursor control from the keyboard. Tracker Ball or a Mouse.



OPTIONAL EXTRAS

Plotter driver generator is available as a optional extra to configure a plotter routin for any BBC compatible plotter. Pre-configured programs for the popular plotter like **Epson HI 80, Hitachi 672, Plotmate Penman** and **HP GL.** This program allow the drawing to be scaled to the maximu plotter size thus enabling drawing of A2 an A3 sizes to be produced with equal ease. Th zoom facility will enable inaccuracies drawing on the screen to be eliminated.

ROUTCAD, an optional software packa for our Graphics Workstation allows f production of shapes drawn usi NOVACAD in 3D on suitable material and ideal for a range of applications includi template making and model building.

NOVACAD package includes a 16K ROM, Utility disc and a comprehensive manual.

WINDOMATIC

All users of Acorn's VIEWSHEET spreadsheet program will be aware of its powerful windowing facility which allows the screen and/or printer to be configured in upto 10 separate windows taken from anywhere in the sheet. They will also be painfully aware of how difficult and time consuming it is to set up a required display. Although VIEWSHEET allows configurations to be saved to the media, it does not have provision for deciphering them.

WINDOWMATIC has been produced with the intention of recitifying these shortcomings and to bring out the very best from VIEWSHEET.

WINDOMATIC provides a quick and easy way to configure screen and printer allowing complicated documents and reports to be set up much more easily. It displays complete text information on all 20 windows and accurate graphic representation of the screen and printer output.

The package includes a screen dump routine for Epson printers and allows use of other printer dump packages.

The program is compatible with BBC Master, B + and 6502 and Turbo second processors. It can be entered from VIEWSHEET by use of function keys or It may be run by loading a previously saved window configuration from disc.

The program is supplied on a disc with a comprehensive manual.

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(24 hr viewdata system)
Tel:01-450 9764

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Telex:922800

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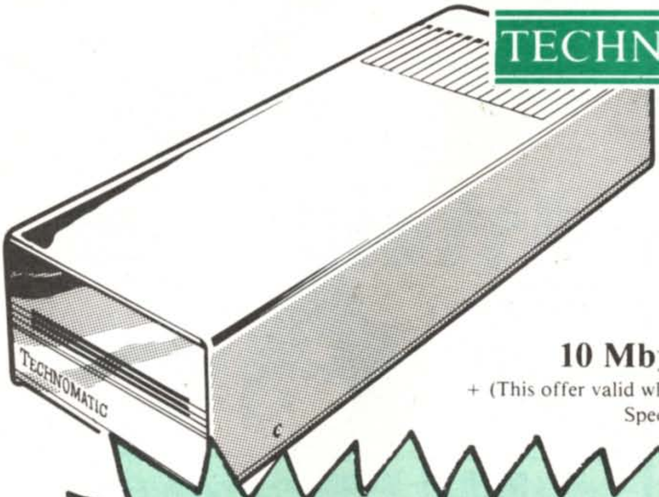
A PRICE BREAKTHROUGH



TECHNOMATIC WINCHESTERS

- Cased with power supply and cooling fan
- 1 Mhz bus extension cable
- Fully compatible with Acorn ADFS and FS III
- Fully compatible with S.J. Research file server
- 12 months warranty

10 Mbyte £399 (a); + 20 Mbyte £499 (a)

+ (This offer valid whilst current stocks last and on orders received before 27th March)
Special Adaptor for S.J Research File Server £28

SPECIAL OFFERS PAGE

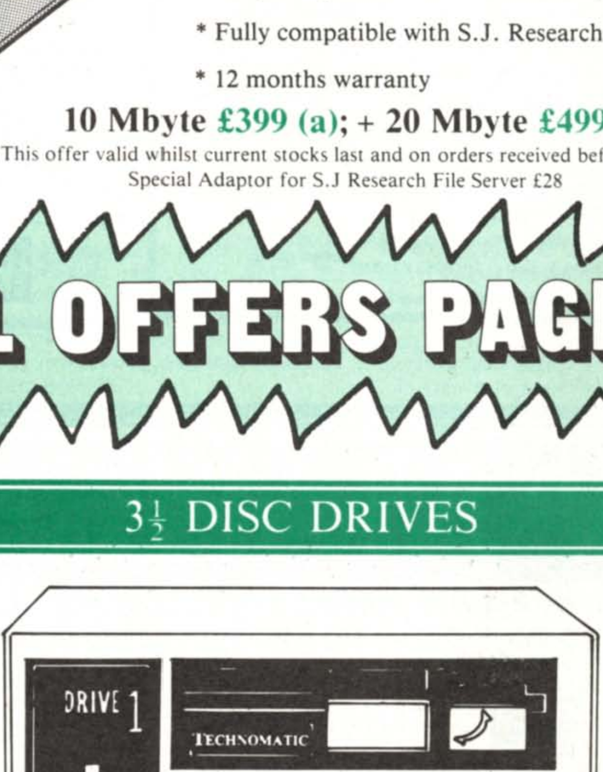
3M FLOPPY DISCS

Individually Tested and Guaranteed for Life

Ever mindful of the catastrophies caused by data loss, 3M make floppy disks that are at least 32% less abrasive than the industry average. Which is why after stringent analogue and digital tests each 3M floppy disk is guaranteed error free for life.

FREE CLOCK CALCULATOR WITH EVERY 5 BOXES OF 3M DISCS PURCHASED.

$3\frac{1}{2}$ DISC DRIVES



- 400K/640K capacity perdrive in DFS/ADFS modes.
- Mitsubishi 80 track double sided ultra low power, fast access mechanisms.
- The drives are supplied fully cased and with cables ready for connection to a computer.
- Drives powered from the computer
- 2 years warranty.

Single Drive £75 (b)

Dual Drive £134 (b)

CASPER UPGRADES BBC TO 68000

FOR **£299** + £2.50 P+P + VAT

'C' Compiler £99 + £2.50 P+P + VAT

As reviewed by Mike Cook, Micro User March '87.

- 68000 2nd processor card with 128K RAM.
- 68000 two pass assembler with system monitor and BBC link software in EPROM.
- Two system diskettes (40 or 80 track).
- Cable and fixings.
- Comprehensive Users Manual covering installation, assembler instructions and teaching guide.

CA Special Products Ltd.
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Remittances by post or Tel: **0383 823928**
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Does your BBC have a one track mind?

MASTER COMPATIBLE

True multi-tasking will put you out of your misery!

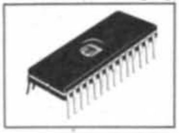
Your BBC now has the true multi-tasking potential of much bigger machines.

CMS Soft have cracked it!

This module, packaged as a ready-to-fit sideways ROM, brings you a robust system that holds its own in the most demanding industrial and laboratory conditions.

And there is no interference with normal BASIC functions; Multi-Basic enhances the power, speed and readability of the best BASIC Interpreter there is.

£39⁹⁵ incl. p+p



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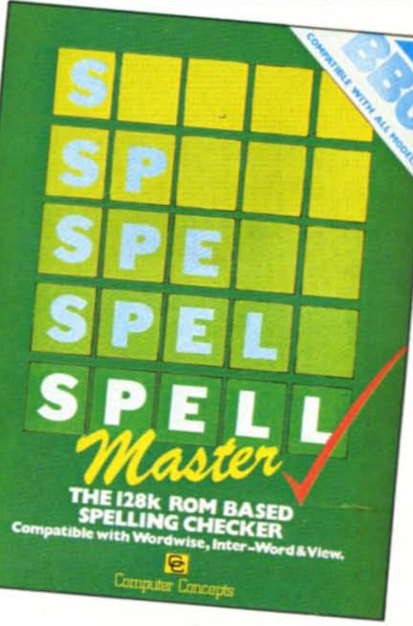
John Allen tries out an aid to bleep out the mistakes

A nice way with words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THE 128k ROM BASED SPELLING CHECKER
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Computer Concepts

WORD processing is now a major application for micros, but merely manipulating words is no longer enough. The computer is capable of more and software is finally emerging to allow this greater sophistication on the BBC Micro.

Last year saw the release of Acornsoft's spelling checker Viewspell which has a 75,000-word dictionary on an 80 track disc.

It works by checking the words in a document against its dictionary after the whole document has been typed. Typically this takes around two minutes for a two page document.

After Viewspell has identified incorrect words the word processor is re-entered to make the corrections.

Computer Concepts has approached its spelling checker from a different direction. Spell-Master has the dictionary on rom so it sits inside the computer allowing much faster access.

This means that as well as operating as a language system like Viewspell it can also operate from within a word processor, checking words as they are typed.

Spell-Master is supplied on two roms mounted on a board that fits into just one socket – making a massive 128k on board. As well as the 57,000-word dictionary this holds the Spell-Master code.

The rom board can be fitted into any of the spare rom sockets on the BBC B or B+. It is designed to overhang roms in adjacent sockets – with the exception of double height ones such as Inter-Word which are too tall.

On the Master Compact it needs to be installed into one of the two higher sockets.

On the Master it can be installed in the highest socket (unless you have one of the early Master 128s where the operating system is on a dual chip) or it can be inserted into a Care Electronics rom cartridge.

The checker has linkages to Inter-Word, View, Wordwise and Wordwise-Plus for immediately checking words as they are typed in.

Inter-Word already has menu 8 built in for Spell-Master. View, Wordwise and Wordwise-Plus users need to press Control+J when in edit mode to get the Spell-Master menu window.

In all of the systems, once activated, Spell-Master issues a beep every time you type a word that is not in the dictionary.

A spelling checker is not much use if it does not let you add words to an existing dictionary or create your own.

Spell-Master does this by building up user dictionaries in sideways ram. While sideways ram is a standard feature on the Master and Master Compact, if you own a model B or B+ you do need to have a sideways ram board fitted.

It is the immediate checking of words that is the most impressive feature of Spell-Master and the one which will contribute most to its success.

All words of three letters or more are checked. I have used it with Inter-Word, Wordwise-Plus and View 3.0 and found that it did not perceptibly slow down the action of the word processor.

It does look neater with Inter-Word (due to the built-in menu) but it functioned equally well in all three.

In View it is sometimes necessary to reformat the text after corrections from Spell-Master, but this is the same when performing corrections normally.

The Spell-Master menu allows the whole text, a marked section or the text after the cursor to be checked.

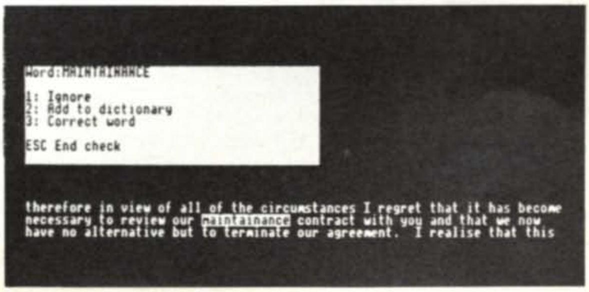
The dictionary can be browsed through and you can switch the immediate checking facility on or off.

When Spell-Master issues its beep telling you that that a word is not in the dictionary the most probable reason is that it is simply mistyped.

If the word is corrected Spell-Master will remain silent, but if after altering the word you attempt to move the cursor away and the word is still not in the dictionary you'll hear another beep. But at no time are you forced to take any action.

Pressing Control+C checks the word at the cursor. If the word is not in the dictionary a window appears giving the

Turn to Page 116 ▶



```
Word:MAINTAINANCE

1: Ignore
2: Add to dictionary
3: Correct word

ESC End check

therefore in view of all of the circumstances I regret that it has become
necessary to review our maintainance contract with you and that we now
have no alternative but to terminate our agreement.  I realise that this
```

Figure I: The Spell-Master menu in View

◀ *From Page 115*

options of ignoring it, adding the word to the user dictionary or browsing through the main dictionary.

If the third option is chosen the whole dictionary can be examined, using the cursor keys until the correct spelling is found. At this point pressing Return will replace the original word in the text with the corrected one.

Pressing Control+V at any time will check the text from the current cursor position to the end.

As with Control+C any words not found in the dictionary will cause a window to appear giving the options of ignoring the word, adding it to the user dictionary or browsing through the dictionary to find the correct spelling.

If you are unsure of how a word is spelt you can enter the dictionary browse option, find the word and press Return to insert it into your text.

A number of useful commands are provided as star commands allowing you to look at parts of the dictionary – these are a great help for solving crossword clues.

The authors of Spell-Master have also included a text editor which performs a number of functions. Cursor movements are compatible with Wordwise and Inter-Word, blocks of text can be marked, moved, copied or deleted and there is a search and replace facility so it could be used as a simple word processor.

This means that files from sources other than the word processors already mentioned can be loaded into the editor and checked.

The checking is carried out in much the same way as checking the entire text in one of the other packages. In the editor the checking menu appears after pressing f1.

The editor also provides the means to create user dictionaries and edit the contents of existing ones. This is important, otherwise words that are wrong can be accidentally added – and never removed.

One of the options in the editor allows you to do is to spell-check files. This might be useful if a file is too large to fit in memory.

It works by reading in the original file word by word, checking each one and writing it out to an output file. If the word is not recognised it is preceded with .

If the output file is the same as the input file, the first letter of the unrecognised word is replaced with the backslash \. In both cases a list of words not found is placed in the editor.

Although the Spell-Master dictionary is smaller than Viewspell's, in practice I did not find much difference in the number of words that I use which are not included.

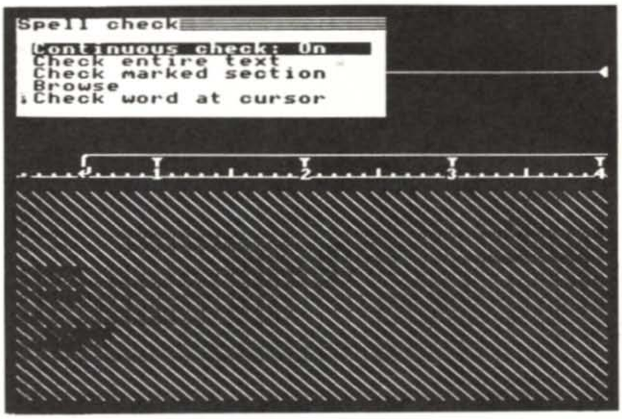


Figure II: The Spell-Master menu in Inter-Word

Viewspell's dictionary is probably more consistent, being supplied by Longmans, whereas Spell-Master's is more pragmatic. Neither have much in the way of proper names, but Spell-Master seems slightly better for computer terms.

Even if the only function of Spell-Master were to check text as it is typed this would be a remarkable product, but in fact it is far more versatile than that.

If you regularly do word processing you will quickly appreciate that the whole range of commands add together to improve your style and confidence, whichever word processing system you use.

Spell-Master is very fast, the dictionary is adequately sized and it is easy to use.

However, it is not really usable without having sideways ram for the user dictionary, which will be a problem for many B and B+ owners, though I understand Computer Concepts is thinking about bringing out a low priced extension board.

Additionally it is not possible to search the dictionary with variable length wildcards.

Spell-Master is more expensive than Viewspell but for the serious user it is a much better buy. Used with Inter-Word it provides the standard of word processing facilities you expect, but do not always get, on much more costly machines.

Star commands

***ANAGRAM:** Entering a string of letters causes Spell-Master to list all the words in the main dictionary that are anagrams of those letters.

***BROWSE:** Allows you to examine the dictionary, either by using the cursor keys to move around, or by typing in the first few letters of a word. It includes the main dictionary and any user dictionaries present.

***CHECK:** Checks for a particular word in the main dictionary. It allows wildcards to be used: # for any character and * for any number of characters.

There are a couple of restrictions, however: You have to give the first two letters of the word and * can only be used at the end of a word. This means it is not as powerful a command as Viewspell's SEARCH.

***CROSSWORD:** This really shows the speed of Spell-Master. It is similar to CHECK in that you give the letters you have with # for the unknown ones.

But unlike CHECK this will allow wildcards in place of the first two letters.

Looking for "worthwhile", (which is near the end of the dictionary) giving "###thwhile" took 8.57 seconds on my model B. The same test with SEARCH in Viewspell took over 4 minutes.

***DLOAD/DSAVE:** These commands load and save the user dictionary into and out of sideways ram.

***FUZZY:** Lists words in the dictionary which sound like the one you give. This is to allow approximate spellings to be entered.

Generally I found this worked well – sometimes it gave only a couple of options, sometimes quite a lot. But it does require the first letter to be right.

For example "philosopher" was not found after typing "filosopher", but it did find it for "philosofer".

***SPELL:** Enters the Spell-Master editor.

***WORKON/WORKOFF:** Enables and disables the Spell-Master rom from claiming the 256 bytes that it needs to do the instant spell-checking in View or Wordwise.

Unless instructed by the *WORKOFF command it will always claim this space if View or Wordwise are present. It does not require this space when working with Inter-Word.

Product: Spell-Master
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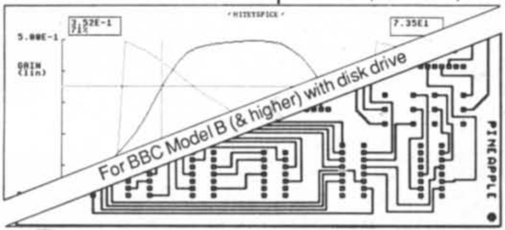

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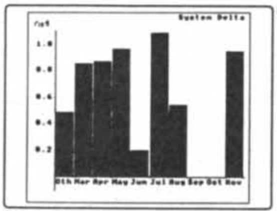

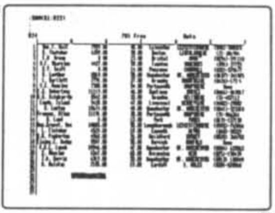

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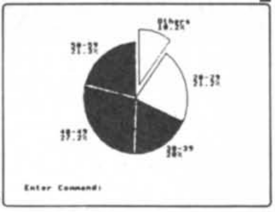

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A comparison of three 65C12 assemblers

Feature	ADE +	BBC Basic	MACROM
Number of pseudo-ops	64	4	36
Use of all available RAM	Yes	No	No
Macros	Yes	No	Yes
String functions	Yes	Yes	No
True macro libraries	Yes	No	No
Relocatable output	Yes	No	No
Linker with libraries	Yes	No	No
High level constructs	Yes	Yes	No
Use any editor?	Yes	No	No
Number of error reports	39+warnings	3+BASIC errs	20
65C00 extended opcodes	All	65C12 only	65C12 only
Switch off 65C12 opcodes	Yes	No	No
ROM size	32K	16K	16K
Disassembler	Symbolic	No	Simple
Label restrictions	No	Yes	Yes

ADE+

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ADE+ MMU and 65C00 series assembler on disc (3.5" ADFS). 32K sideways RAM required.
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ADE+ is a 65C00 series assembler system supporting all the mnemonics of the 65C12 used in the latest BBC microcomputers plus the additional 'Rockwell' instructions. ADE+ is fast, faster in fact than the in-built BASIC assembler and all rival products that we have tested. The assembler produces absolute code that can be *RUN or linker modules that can be merged with the output from other programs using the ADE+ linker. ADE+ supports a powerful linker which drastically cuts assembly time; a feature normally only found on minis and mainframes. The linker will even link the output from compilers with your assembly language programs. Full library support for both the linker and the assembler is provided - fast searching for unknown instructions in a random access macro library. ADE+ is a modular system with many modules to add later; i.e. a mouse based editor & a Z80 cross assembler! A print spooling system uses sideways RAM as a print buffer to eliminate waiting time; your listing runs off as a background job! Use the print spooler from BASIC or your own programs. ADE+ uses ALL available memory. With a second processor attached the IO processor spare memory is used as a buffer to reduce the amount of disc access. All available memory is handled by ADE+'s intelligent memory management module. Use your own favourite editor or the one provided. Assemble from disc or memory. Full utilities including librarians, converter for BBC BASIC etc. ADE+ must be *the* bargain of 1986/7!

Peter Davidson continues his exploration of electronic mail

Golden opportunities

LAST month I looked at how you send a letter using electronic mail (Email). As with ordinary letters, which can be sent recorded, registered and so on, there are a lot of options available to senders of Email.

This month I intend to look at some of the options available to people using the Telecom Gold system – similar facilities exist on most Email services.

First, a word of advice. To save you the embarrassment of all your mistakes showing when your letters are received by someone else, try out new features by writing to yourself first.

To see the results in your own mailbox, just enter your mailbox number when you are prompted for the name or number of the person you are sending the letter to.

You'll notice that most of the illustrations in this article are from MAG001 to MAG001 – that's from me to me.

It's rather impersonal to have to enter a number at the "To" prompt each time you send a letter. You can set up your own directory so that you can send mail by name rather than number.

To illustrate this we'll set up a directory with four entries in it. You start by creating a MAIL.REF file: To do this at the prompt enter:

```
ED
```

The computer will respond with:

```
INPUT
```

Now type in your names and numbers separated by a space with each one on a new line.

If you want to send mail to a group of people you can attach more than one number to a name by including them in the list separated by spaces.

When you have finished entering the names press Return on a blank line and the computer will respond with:

```
EDIT
```

You are now in edit mode and can easily save the file. Type:

```
SAVE MAIL.REF
```

The result of setting up my MAIL.REF file is shown in Figure I. Just as with letters, the file can be created on a word processor and transmitted when you are ready. There's no need to type it in while you are online.

You'll notice that the last entry in Figure I contains two mailbox numbers. This means that by sending a letter to LOT both MAG001 and MAG999 will receive copies.

Unfortunately you can't put your own number there twice so this is one you can't try within the confines of your own box.

Before leaving the subject of MAIL.REF files, there are a couple more points you should know.

Firstly, if a file already exists you can't save a new one. To erase an existing file, at the prompt type:

```
DESTROY MAIL.REF
```

It is possible to edit a file on the Gold computer, but that would be the subject of an article on its own. For now let's just say that if you want to change a file, delete the old one and start again.

If you keep your word-processed file it can be edited and retransmitted to Gold at any time.

Sometimes you may want to know that a recipient has received your Email. All you have to do is put AR (Acknowledgement Requested) into your message.

As with all the options I'll be discussing there are two places where this command can be put – either as part of the "To" line or at the end of the message, where it has to be preceded by a full stop.

Figures II and III show the two ways of issuing the command and Figure IV shows what the sender will see.

If your message is so important that you want more than just an acknowledgement you can insist that the recipient replies. The command to do this is RR (Reply Requested) – again, it can entered in either of the two places.

Figure V shows how the recipient is prompted for a reply. As you can see, it is possible to Quit, but the letter will still be there next time the mail is read and will have to be replied to before it can be deleted.

Your letter must be important if you have asked for an acknowledgement or reply, so to ensure it arrives quickly you can also send it express. This puts your letter at the front of the recipient's mail queue.

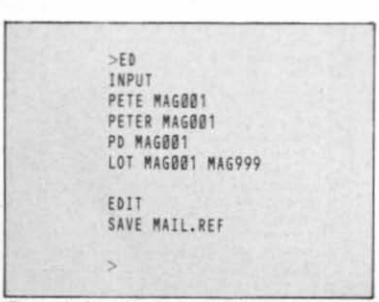
If he is online, it puts the following message on his screen to say that a letter has arrived:

```
Express letter call from MAG001
```

The command to send express letters is EX and it goes in one of the usual places. It can be combined with one or more other commands such as:

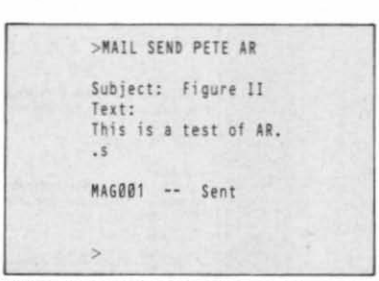
```
To: MAG001 AR RR EX
```

Why would you want to request a reply and an acknowledgement on the same letter? You will receive an acknowledgement as soon as the recipient looks at



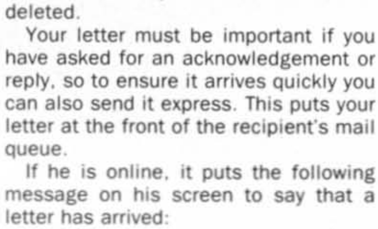
```
>ED
INPUT
PETE MAG001
PETER MAG001
PD MAG001
LOT MAG001 MAG999

EDIT
SAVE MAIL.REF

>
```

Figure I: Creating a simple MAIL.REF file



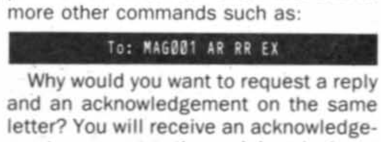
```
>MAIL SEND PETE AR

Subject:  Figure II
Text:
This is a test of AR.
.s

MAG001  --  Sent


>
```

Figure II: Asking for an acknowledgement with the command in the address line



```
>mail send Peter


Subject:  Figure III
Text:
Another test of AR.
.ar
.s

MAG001  --  Sent


>
```

Figure III: Acknowledgement requested as an afterthought



```
>mail read


     To:  MAG001
   From:  MAG001                  Posted: Mo
n  16-Feb-87  21:43 GMT Sys 72  (1)
Subject:  Figure II
Acknowledgment Sent

--More--
```

Figure IV: Recipient's message when he reads acknowledgement requested mail

his mail but, although he can't delete the letter without replying, he can leave responses until later.

Confidentiality can be a problem if more than one person has access to a mailbox. If you want to restrict certain mail to one box user to read you can give that person a password and use it on any mail you send him by using PA followed by the password.

Figure VI shows how to send a message with a password attached, and Figure VII shows how the message is received and the result of entering both an incorrect and a correct password.

If you are the forgetful type dated mail gives you an ideal way to remind somebody (even yourself) to do something on a specified date.

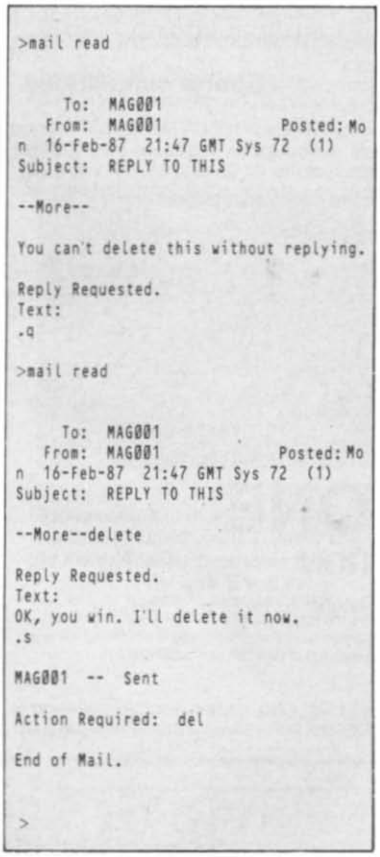
Mail sent using this method will not reach the recipient until that date and the form of the command to send it is:

```
DA d/m/y
```

So if I want a letter to arrive on February 14, 1988, the command takes the form:

```
DA 14/2/88
```

The way to send a letter like this is shown in Figure VIII, but when it arrives at the recipient it will appear no different to one posted on that date.



```
>mail read


     To:  MAG001
   From:  MAG001                   Posted: Mo
n  16-Feb-87  21:47 GMT Sys 72  (1)
Subject:  REPLY TO THIS

--More--

You can't delete this without replying.

Reply Requested.
Text:
.q

>mail read


     To:  MAG001
   From:  MAG001                   Posted: Mo
n  16-Feb-87  21:47 GMT Sys 72  (1)
Subject:  REPLY TO THIS

--More--delete

Reply Requested.
Text:
OK, you win. I'll delete it now.
.s

MAG001  --  Sent

Action Required:  del

End of Mail.


>
```

Figure V: You have to reply to mail if the sender requests it

One of the big advantages of electronic mail is that multiple copies of a memo or letter can be sent very easily. You can send these copies in several ways, the difference being in the manner the recipients see who the letter has also been sent to.

If the mail is to all recipients just list their names when you are asked who the letter is to – or put several names in your MAIL.REF file as I did with LOT.

So, to send mail to MAG001 and MAG999 I can enter:

```
MAIL SEND MAG001 MAG999
```

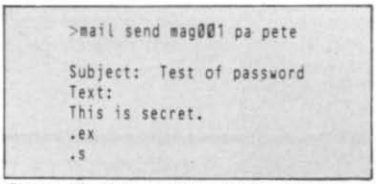
or

```
MAIL SEND LOT
```

The resulting message to the recipient is shown in Figure IX.

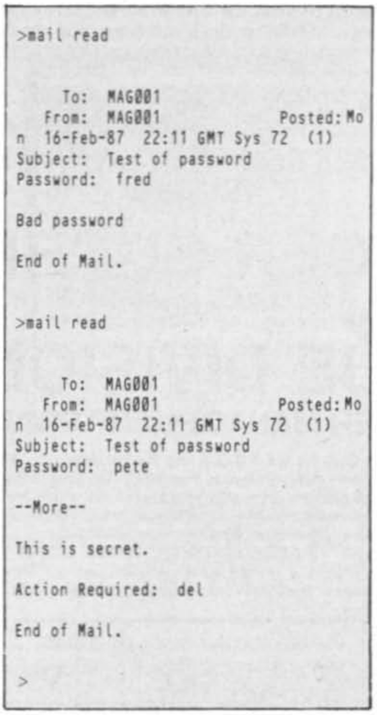
If your mail is to one person, but you want others to see it and the recipient to know they have seen it, then use a Carbon Copy (CC).

For instance, if you send someone a request to do something and want his boss to know you have asked him to do it, use CC and and the boss will receive a copy.



```
>mail send mag001 pa pete

Subject:  Test of password
Text:
This is secret.
.ex
.s
```

Figure VI: Use a password to ensure the confidentiality of mail.



```
>mail read


     To:  MAG001
   From:  MAG001                   Posted: Mo
n  16-Feb-87  22:11 GMT Sys 72  (1)
Subject:  Test of password
Password:  fred

Bad password

End of Mail.


>mail read


     To:  MAG001
   From:  MAG001                   Posted: Mo
n  16-Feb-87  22:11 GMT Sys 72  (1)
Subject:  Test of password
Password:  pete

--More--

This is secret.

Action Required:  del

End of Mail.


>
```

Figure VII: You must know the password to read password protected mail

The actual recipient will also know that the boss has been sent the copy as shown in Figure X. Although I've only sent one copy, CC can be followed by a whole list of names or numbers.

In the above example, if you didn't want the person to know that the boss had been sent a copy, use BC (Blind Copy) instead of CC. The boss will still be sent a copy but no indication will be given to the recipient of the original.

It is possible to store a letter that you frequently send, or one that you want to send to several people in a slightly different form, on the Gold computer. To do this all you have to do is type:

```
XMIT
```

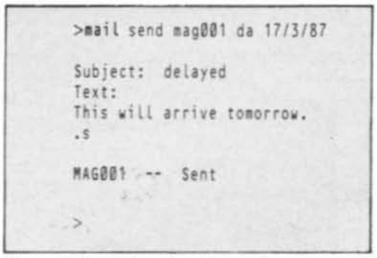
You will be asked whether you want to transmit to or from the computer and you obviously answer:

```
TO
```

You will then be prompted for a filename – I'll use LETTER for this example – and you'll then be told to prepare your tape or disc.

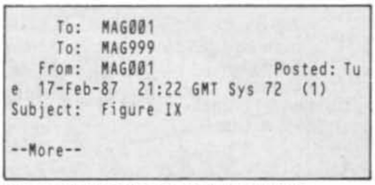
At this point you can send a word-processed letter as I described last month, or ignore the prompt and press Return then type in your letter. When you

Turn to Page 120 ▶



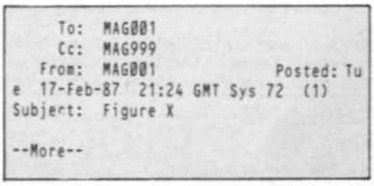
```
>mail send mag001 da 17/3/87

Subject:  delayed
Text:
This will arrive tomorrow.
.s

MAG001  --  Sent


>
```

Figure VIII: Delayed mail is an ideal way of sending reminders.



```
     To:  MAG001
     To:  MAG999
   From:  MAG001                   Posted: Tu
e  17-Feb-87  21:22 GMT Sys 72  (1)
Subject:  Figure IX

--More--
```

Figure IX: Email can easily be sent to several people at the same time



```
     To:  MAG001
     Cc:  MAG999
   From:  MAG001                   Posted: Tu
e  17-Feb-87  21:24 GMT Sys 72  (1)
Subject:  Figure X

--More--
```

Figure X: Use carbon copies to show the recipient that somone else has a copy

◀ *From Page 119*

have finished type:

```
.END
```

The letter will be saved as a text file and Figure XI shows the complete operation. The saved file can be loaded as part or all of any letter by entering:

```
.LOAD LETTER
```

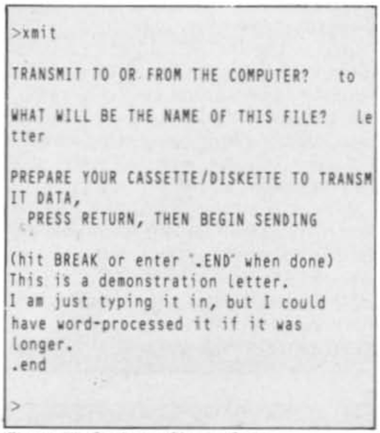
Figure XII shows me sending the same letter (which I had previously saved) to two different people, though with varying first lines. When you have finished with it, LETTER can be deleted using the DELETE command.

Well, there you have it. Just some of the possibilities when you send Email.

The best way to familiarise yourself with these is to work through the figures, substituting your own mailbox number for MAG001, then experiment with various combinations of commands.

You'll notice that I have mixed upper and lower case letters in the figures – you can use either.

And remember, to save you looking silly when the unexpected happens and your mail doesn't go exactly as planned, practice by sending letters to yourself.



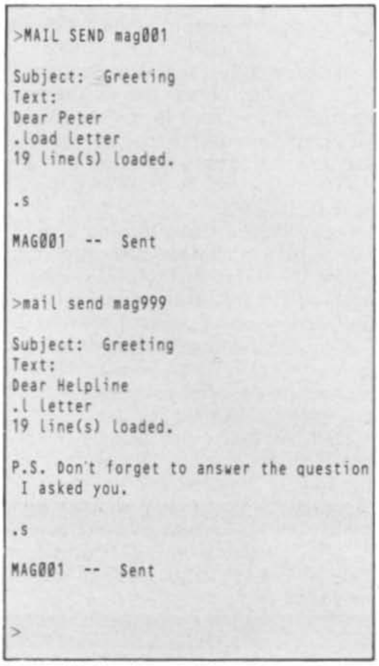
```
>xmit

TRANSMIT TO OR FROM THE COMPUTER?   to

WHAT WILL BE THE NAME OF THIS FILE?   le
tter

PREPARE YOUR CASSETTE/DISKETTE TO TRANSM
IT DATA,
  PRESS RETURN, THEN BEGIN SENDING

(hit BREAK or enter ".END" when done)
This is a demonstration letter.
I am just typing it in, but I could
have word-processed it if it was
longer.
.end

>
```

Figure XI: Saving a file on Gold computer for later use

Gold even provides you with an easy way to do this. Try:

```
MAIL SEND ME
```

● *Next month, we'll take a break from Email and look at some of the sources of telesoftware available and how you can quickly obtain a copy of a program down the telephone wires from a friend who is miles away.*



```
>MAIL SEND mag001

Subject:  Greeting
Text:
Dear Peter
.load letter
19 line(s) loaded.

.s

MAG001  --  Sent


>mail send mag999

Subject:  Greeting
Text:
Dear Helpline
.l letter
19 line(s) loaded.

P.S. Don't forget to answer the question
 I asked you.

.s

MAG001  --  Sent


>
```

Figure XII: Send a quick letter by using a saved file as part of it

QUAL-SOFT THOUGHTWARE **Sports simulations**

Way back in 1983 we introduced LEAGUE DIVISION 1 for the BBC Micro. In September 1984 the original version of SOCCER SUPREMO, and the LD1 upgrade DIV1 '85 were introduced, the 1st graphics oriented, the 2nd an out and out strategy game. In both games you become the manager of a newly promoted 1st division team, which you have to build up into a challenger, and hopefully winner, of the 1st Division Championship. The game uses professional simulation techniques which produce a true, natural management simulation rather than the simple minded mental arithmetic exercises of other "simulations". This caused this response:

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WELL DR HARLEY

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U.E.F.A. Cup
Cup Winners Cup

AND

TAPE 1
6 Seasons
Division 1 Football
The F.A. Cup

LEAGUE DIVISION ONE

A SOCCER MANAGEMENT SIMULATION

TAPE 2
European Cup
U.E.F.A. Cup
Cup Winners Cup

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____
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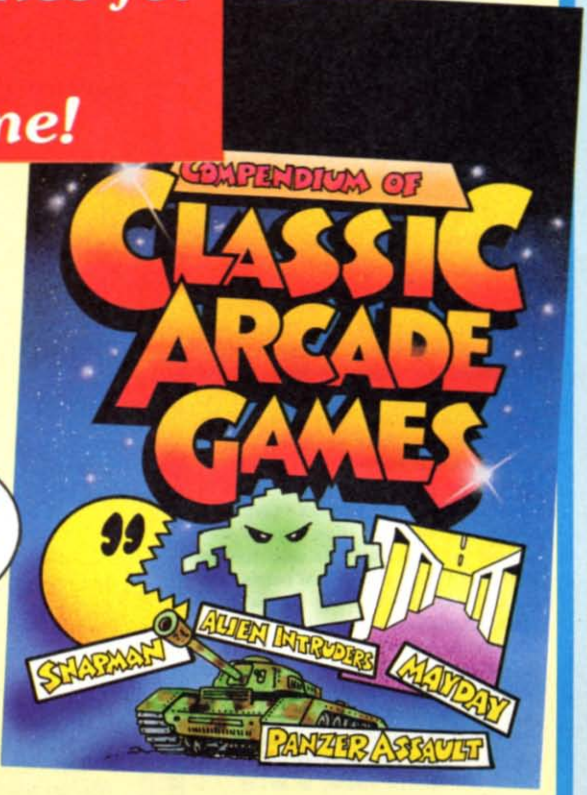
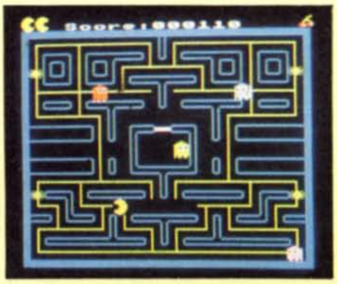


THOUSANDS OF COPIES SOLD!



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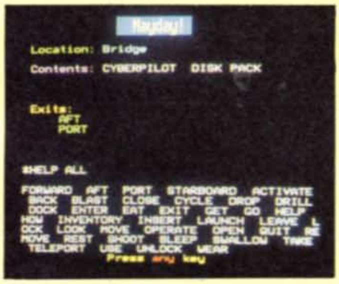

```
Mayday!
Location: Bridge
Contents: CYBERPILOT  DISK PACK

Exits:
    AFT
    PORT

*HELP ALL

FORWARD  AFT  PORT  STARBOARD  ACTIVATE
 BACK  BLAST  CLOSE  CYCLE  DROP  DRILL
 DOCK  ENTER  EAT  EXIT  GET  GO  HELP
HOW  INVENTORY  INSERT  LAUNCH  LEAVE  L
OCK  LOOK  MOVE  OPERATE  OPEN  QUIT  RE
MOVE  REST  SHOOT  SLEEP  SWALLOW  TAKE
 TELEPORT  USE  UNLOCK  WEAR
          Press any key
```

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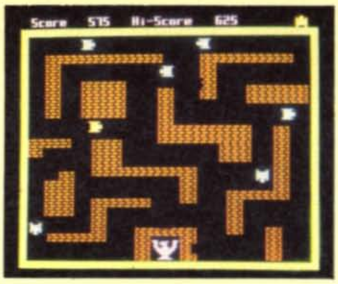
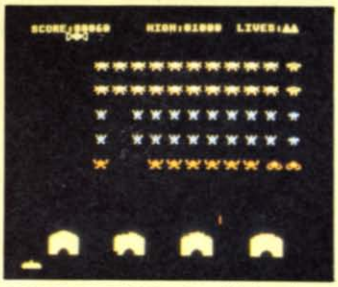


PANZER ASSAULT – You are a tank commander engaged in vicious combat against encircling enemy forces.



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TO ORDER TURN TO THE FORM ON PAGE 159

THE MICRO USER

PROGRAM Library No. 2

Compiled by Steve Turnbull

WELCOME to part two of the Library, and thanks for sending in all your routines. Remember, they can be in any language.

This month we have an advancement on the FNin routine, an all-singing shift-down routine for Basic programs, a 6502 machine code routine for turning the cursor on and off, and a couple of routines to tidy up the Master clock.

A quick word on how you should present your routine: It should have a brief description of its salient points, perhaps a justification of why it's better to use then anything else, and an example program to demonstrate how it works.

In Basic avoid all GOTOs and GOSUBs, because any routine should be relocatable into any program. And in machine code make sure all memory locations are named – such as *charbuff* instead of &C00, and *oswrch* instead of &FFEE.

Happy programming.

Send your routines – with full details of the language it is written in and the hardware/software requirements – on disc or tape to:

Steve Turnbull, Library, The Micro User, 68 Chester Road, Hazel Grove, Stockport SK7 5NY.

Remember to enclose a stamped addressed envelope for the return of your media. Five blank discs will be sent to the authors of any routines published.

Title: STRING INPUT
Language: Basic
Author: Teri Paul

String input using the Basic INPUT command (or osword 0 from any language) is very dangerous. Try typing:

```
MODE 7:INPUT A$
```

Then press the following keys in order Control+V, Control+E, Control+Y, Control+E, A, A, A, A. This changes to Mode 5 then draws a line on the screen – all from an INPUT comand.

But good commercial programs don't allow this, what they use is an idiot-proof input routine.

Here is a general string input routine which behaves identically to the INPUT statement which takes as parameters, permissible keys, an initial string, the maximum line length and whether a zero length string is acceptable. It uses the FNin routine as a building block.

Line 140 contains essential initialisation, *dl$* is Delete, *ln$* is the line delete – Control+U – and *cr$* is Return.

While this has been kept to the normal values for input, you could change these to any keys – for instance Control+K to Kill a line.

Line 270 ensures that the cursor is positioned correctly in the line. Lines 280 to 300 select the acceptable keys, and particularly whether *cr$* is allowed when the input string has length zero.

Line 310 gets the input character and line 320 selects the appropriate procedure to either delete a character, delete a line or add a character.

The main part of the routine repeats until a *cr$* has been accepted.

A new line is generated on screen and the final string is returned.

```
  100 REM ** String Input **
  110 hi$="ABCDEFGHIJKLMNOPQRSTUVWXYZ"
  120 lo$="abcdefghijklmnopqrstuvwxyz"
  130 nm$="0123456789":sp$=" "
  140 dl$=CHR$127:ln$=CHR$21:cr$=CHR$13
  150 PROCcursoff:s$="":CLS
  160 REPEAT
  170 PRINT'"Type in a line:"
  180 s$=FNstr(hi$+lo$+nm$+sp$,s$,100,TR
UE)
  190 UNTIL s$=""
  200 PROCcurson:END
  210 ---
  220 DEF FNstr(k$,s$,L%,T%)
  230 LOCAL X%,Y%,P%,a$,i$
  240 X%=POS:Y%=VPOS
  250 P%=LENs$:PRINT s$;
  260 REPEAT
  270 VDU31(X%+P%)MOD40Y%+(X%+P%)DIV40
  280 a$=k$:IF T% a$=a$+cr$
  290 IF P%>0 a$=a$+cr$+dl$+ln$
  300 IF P%=L% a$=cr$+dl$+ln$
  310 i$=MID$(a$,FNin(a$),1)
  320 IF i$=dl$ PROCdl ELSEIF i$=ln$ PRO
Cln ELSEIF i$<>cr$ PROCad
  330 UNTIL i$=cr$:PRINT:=s$
  340 ---
  350 DEF PROCdl:s$=LEFT$(s$,P%-1)
  360 VDU127:P%=P%-1:ENDPROC
  370 ---
  380 DEF PROCln:LOCAL Z%
  390 FOR Z%=1 TO P%:PROCdl
  400 NEXT:ENDPROC
  410 ---
  420 DEF PROCad:s$=s$+i$
  430 PRINTi$;:P%=P%+1:ENDPROC
  440 ---
  450 DEF FNin(k$):LOCAL I%
  460 PROCcurson
  470 REPEAT I%=INSTR(k$,GET$)
  480 VDU -7*(I%<>0):UNTIL I%>0
  490 PROCcursoff:=I%
  500 ---
  510 DEF PROCcurson
  520 VDU23;29194;0;0;0;:ENDPROC
  530 ---
  540 DEF PROCcursoff
  550 VDU23;8202;0;0;0;:ENDPROC
  560 ---
```

Title: RELOCATOR
Language: Basic
Author: Tim Arrowsmith

When using long graphics programs from disc it is often necessary to shift the program down to the lowest allowable page.

Most shift down routines involve messy function key definitions which are hard to type in correctly.

But it is not necessary to leave the program for the shift down; a much more elegant routine is shown here.

Line 0 is added at the start of your program and the procedure definition itself must be right at the end.

When the program is first RUN, PROCreloc is entered if the page is already equal to or less than the required page then the routine exits.

If the shift-down is required then the "Relocating..." message is displayed and the program is moved down four bytes at a time.

So that you know the program is working there is also the sound statement which starts at the lowest pitch and moves up to the highest pitch.

Finally, PAGE is set to the new value, the keyboard buffer is cleared, then OLD and RUN are inserted along with Ascii value 6 which switches the screen drivers on.

Finally the screen drivers are switched off and the program ends.

While the screen is off the OLD is performed at the new page position resetting TOP, the screen drivers are switched on and the program runs.

PROCreloc is entered a second time. But this time the page setting is acceptable, the routine just exits and the rest of your program is run as normal.

```
    0 PROCreloc(&E00)
    1 REM *** Relocator ***
 1000 END
32600 DEF PROCreloc(Q%):CLS:*Tape
32610 P%=PAGE:IF P%<=Q% THEN ENDPROC
32620 L%=TOP-P%:PRINTCHR$129CHR$136"R
elocating...";
32630 FOR M%=0 TO L%-1 STEP 4
32640 Q%!M%=P%!M%:SOUND17,-4,255*M%/
L%,1
32650 NEXT:PAGE=Q%:A%=138:X%=0:*FX15
32660 $&100="OLD"+CHR$13+"RUN"+CHR$6+C
HR$13
32670 FOR L%=&100 TO &107:Y%=?L%
32680 Z%=USR&FFF4:NEXT:VDU21:END
```

Title: CURSOR ON/OFF
Language: 6502
Author: Jeremy North

Drawing screen displays with the cursor still active looks messy. The following routine allows you to perform the cursor switching in machine code and complements last months Basic routines.

The only point of interest is that the carry flag is in bit position zero.

This means it can be set, the flags pushed on tc the stack, pulled off into the accumulator and then isolated with the AND #1, so creating a value of zero or one in the accumulator.

```
100 REM ** Cursor On/Off **
110 MODE 7:PROCassem
120 REPEAT VDU30:CALL cursoff
130 PRINT"Cursor on? (y/n)";
140 IF FNin("YyNn")<3 CALL curson
150 CLS:FOR Z%=1 TO 20
160 PRINTTAB(RND(40)-1,RND(25)-1)"X";
170 PROCwait(.8):NEXT:UNTIL FALSE
180 ---
190 DEF FNin(k$)
200 LOCAL I%:CALL curson
210 REPEAT I%=INSTR(k$,GET$)
220 VDU -7*(I%<>0):UNTIL I%>0
230 CALL cursoff:=I%
240 ---
250 DEF PROCwait(t)
260 LOCAL T%:T%=TIME+t*100
270 REPEAT UNTIL TIME>T%
280 ENDPROC
290 ---
300 DEF PROCassem
310 DIM code 256
320 oswrch=&FFEE
330 FOR L%=0 TO 2 STEP 2
340 P%=code:[OPT L%
350 .curson  SEC:BCS curses
360 .cursoff CLC
370 .curses  PHP
380  LDA #23:JSR oswrch
390  LDA  #1:JSR oswrch
400  PLA
410  AND  #1:JSR oswrch
420  LDX  #7:LDA #0
430 .loop
440  JSR oswrch:DEX
450  BNE loop:RTS
460  ]:NEXT:ENDPROC
```

Title: MASTER CLOCK/CALENDAR
Language: Basic IV Master Only
Author: Richard Tate

The TIME$ function on the Master is very useful but I found that needed a more compact way of displaying the information.

The routine given here accesses the TIME$ function and then splits it according to the parameter *P%*. When *P%* is 1 the time in 12 hour clock format is returned, when it's 2 the date is returned in dd:mm:yy format, and if 3 then both are returned.

If any other number is used an error is generated.

The two functions FNs and FNz turn their parameters into two digit strings padding to the left with spaces and zeroes respectively.

```
  10 REM ** Master Clock/Calendar
  20 CLS:PRINT TIME$'
  30 FOR P%=1 TO 3
  40 PRINT"Parameter = ";P%" gives "FNc
kcl(P%)
  50 NEXT:PRINT'':END
1000 ---
1010 DEF FNckcl(P%)
1020 LOCAL T$:T$=TIME$
1030 IF P%=1 =FNck(T$)
1040 IF P%=2 =FNcl(T$)
1050 IF P%=3 =FNck(T$)+" "+FNcl(T$)
1060 ?&700=0:?&701=50
1070 $&702="Bad parameter"
1080 ?&70F=0:CALL &700:=0
1090 ---
1100 DEF FNck(T$)
1110 LOCAL H%,M%,X$:H%=VALMID$(T$,17)
1120 IF H%>12 H%=H%-12:X$="pm" ELSE X$=
"am"
1130 M%=VALMID$(T$,20)
1140 =FNs(H%)+"."+FNz(M%)+" "+X$
1150 ---
1160 DEF FNcl(T$)
1170 LOCAL D%,M%,Y%,M$,m$
1180 D%=VALMID$(T$,5)
1190 M$=MID$(T$,8,3)
1200 Y%=VALMID$(T$,14)
1210 RESTORE 1290:REPEAT
1220 READ m$,M%:UNTIL m$=M$
1230 =FNs(D%)+":"+FNs(M%)+":"+FNz(Y%)
1240 ---
1250 DEF FNs(N%)=RIGHT$(" "+STR$N%,2)
1260 ---
1270 DEF FNz(N%)=RIGHT$("0"+STR$N%,2)
1280 ---
1290 DATA Jan,1,Feb,2,Mar,3,Apr,4
1300 DATA May,5,Jun,6,Jul,7,Aug,8
1310 DATA Sep,9,Oct,10,Nov,11,Dec
```

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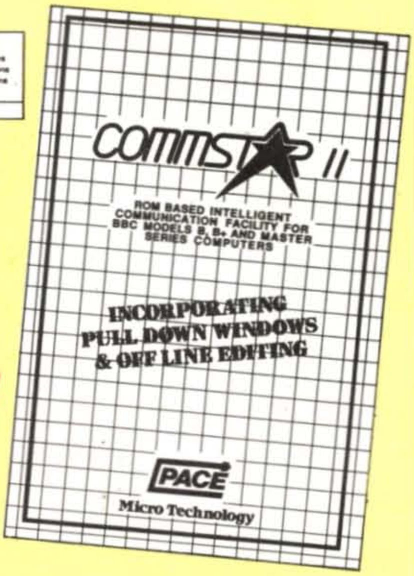
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TO ORDER TURN TO THE FORM ON PAGE 159

Nigel Peters ends his series on spreadsheets with another look at Ultracalc

Functions and facilities

WELCOME to the second article on BBC Soft's Ultracalc and the final article in this spreadsheet series. This month we'll be taking a look at some of the functions and facilities that Ultracalc has which our old friend Mini Office II doesn't.

The first point to make is that the manual defines the difference between a function and a facility as the fact that a function applies to one cell only while a facility applies to an area.

And in case you're wondering what a function is, it's a piece of mathematical working like sine, cosine, logarithm and so on.

These functions can work on either a number, the coordinates of a cell containing a value (not a label) or a formula. So:

```
LOG(10)
LOG(A1)
LOG(A1+A2)
```

are all acceptable.

They can be used in formulae just as you'd normally use values or cell coordinates. This allows you to put formulae such as:

```
2+LOG(A1)
```

into the active cell.

Because it resides in rom, Ultracalc has more functions than spreadsheets that live in memory such as the disc-based Mini Office II.

The three standard trignometric functions SIN, COS and TAN are there along with DEG and RAD to deal with degrees and radian measure respectively.

The presence of these allows Ultracalc to perform sophisticated mathematical calculations – as well as helping with the kid's homework.

And, if you understand them, there's ASN, ACS and ATN to deal with arc-sine, arc-cosine and arc-tangent.

Still on maths, if you feel the need to raise the constant e (2.17 . . .) to a power, then the EXP function is ready and willing to do it for you.

You can also have a square root at the drop of a SQR and get the absolute value of a number – the value ignoring any minus sign there may be – with ABS.

Finally PI which gives the the value of pi and FIX which gives you the integer part of a real – FIX(12.34) is 12 – finish of the mathematical functions.

One interesting function is SGN. It takes the form:

```
SGN(parameter)
```

where *parameter* is a value, cell number or formula. When it's used it examines the value of *parameter* and returns 1 if it's positive, –1 if it's negative and, logically enough, 0 if it's a zero value. So the following:

```
SGN(-23)
SGN(99)
SGN(0)
```

return values of –1, 1 and 0 respectively.

This may seem a little pointless but it does help the spreadsheet choose between alternatives, a subject we'll deal with later.

And who isn't interested if his business has made a profit, loss or just broken even?

While you may not use or understand all of these, I think that you'll agree that they allow some sophisticated modelling using the spreadsheet.

They're not just confined to financial analysis but can be used in educational and scientific work.

What functions you actually get depends on the spreadsheet you're using. As a rule of thumb, the more you pay the more you get.

The question to ask yourself when buying a spreadsheet is which you'll actually use. There are some wonderful spreadsheets around with all sorts of functions but for most people the vast majority of them will never be used.

Closely related to the functions are Ultracalc's facilities, in effect functions that deal with areas of the spreadsheet rather than just one cell.

Despite the fact that they deal with areas, they still return their result to one cell only.

The SUM facility allows you to sum up the values in an area, any labels that might be there being ignored. This means that:

```
SUM(A1B2)
```

puts the total of the four cells A1, B1, A2, B2 into the active cell or into the formula that SUM is part of. Similarly:

```
SUM(A1A5)
```

totals the values in the first five cells of column A while:

```
SUM(A2E2)
```

does the same job for the second column.

This is very similar to the command we had in Mini Office II, only applied to areas as well.

As you might expect, there are commands for finding the maximum and minimum values in an area. Restrain your amazement when I inform you that these are called MAX and MIN.

There's also a CNT facility which returns the number of cells in a given area that actually hold values. To see what use this is, suppose that you have a spreadsheet with details of four projects.

You could set aside an area of memory, say D5E6 and use these to hold any losses. If there are no losses, there's no entry in that area.

If all four projects make losses then these are recorded in D5, D6, E5 and E6. You can find out the number of projects that are making losses at any time by using:

```
CNT(D5E6)
```

Observant readers will have noticed the "if" in the above explanation. It seems that the spreadsheet has to make a choice, doing one thing if the project is in profit and another if it's in the red.

We couldn't do this with Mini Office II but we can with Ultracalc. And it's all quite logical.

The Ultracalc spreadsheet can take decisions using the IF facility. This takes the form:

```
IF(logical expression,value 1,value 2)
```

What happens when it is used is that the logical expression is evaluated. If it happens to be true, then *value 1* is returned otherwise it's *value 2*.

So, one of two things happen depending on the result of the logical expression. It's easier to see how it works in practice than in theory. Suppose you had:

```
IF(A1=100,105,95)
```

When it comes across this, the spreadsheet will check to see if A1 contains 100. If it does then it returns the value 105, if it doesn't it returns 95. The values can be cell coordinates so you can have expressions such as:

```
IF (A1<>100,A2,A3)
```

Now if A1 isn't 100, the value in A2 is returned, otherwise – when A1 does hold

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100 – you get the value in A3 returned.

A nice feature of IF is that the values returned can be the coordinates of cells holding labels.

Suppose you had the costs of a project in cell A1 and the sales revenue from it in cell A2. You could have the label PROFIT in cell D1 and LOSS in D2. Then:

```
IF (A2>A1,D1,D2)
```

returns PROFIT or LOSS as appropriate.

As you'll probably guess from the above, the IF facility is very powerful and can be much more complex than my examples. Ultracalc allows all the usual comparative operators to be used along with AND and OR.

Another powerful tool is the LKP, or look up, facility. This allows you to search a list for a given target.

Once the target is found, it returns a corresponding value from a separate but parallel list. It takes the form:

```
LKP(target,area1,area2)
```

The parameter *area1* tells the spreadsheet where it is to look for a match to *target*.

Once this is found, the LKP facility returns the corresponding value in the list defined by *area2*. The target can be a number or a label.

To get an idea of how it works, suppose you have a list of cars and their prices in your spreadsheet such as Figure I – would that the prices were real.

```
        A          B
1    Fiesta      1000
2    Escort      2000
3    Sierra      3000
4
5    target      cost
```

Figure I: A list of cars and prices

As you can see, cells A1 to A3 contain the names of three cars. Cells B1 to B3 contain their prices.

Now we can use LKP to search through the list of names in column A and give us the corresponding price from column B. In this case we'd enter:

```
LKP(A5,A1A3,B1B3)
```

into cell B5, where I've put *cost* in Figure I. Then all we have to do is enter the make of car in cell A5, where I've got *target*.

Once this is done LKP searches the list, finds a match and returns the price.

So if you put ESCORT in cell A5, the spreadsheet looks down the list of cars in column A. Finding ESCORT in cell A2 it then looks up the price in cell B2 and puts this value into cell B5.

There's much more to the LKP function than merely matching labels and numbers. You can also search for values or even labels when you only have parts of the name you're searching for.

I think you'll see that combined with the IF function, this ability to look up values in tables makes Ultracalc a sophisticated and powerful tool. And we've only touched the surface of what we can do with them.

Yet, sadly, that's where we have to end. Not just for this month but for ever.

I hope that in the past few months I've given you some idea of how spreadsheets work and how they are used and what to look for in them.

Even so, there's a lot more to them, as some of the facilities we've covered briefly this time show. Have fun exploring them yourselves.

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Trevor Roberts goes deeper into Pseudocode in Part 2 of his series

Underlining the obvious

ALL RIGHT. Hands up all those who spotted last month's deliberate mistake.

There I was, enthusing about how the indentation and underlining helped make my Pseudocode more intelligible – and there was Figure V without an indentation in sight and only an apology for underlining.

Sorry about that. There's many a slip between cup and lip and in this case many a slip between word processor and typesetter as well. My beautiful Pseudocode became garbage.

Still it's an ill wind and all that and the mistake can be put to use. After all by comparing Figure I (last month's Figure V) with Figure II (which is what was intended to be last month's Figure V) you should see how indentation and underlining helps.

The structure of the program shows more clearly.

Underlined

For a start it's easy to find the mini-algorithms as each one has been given an underlined title. Also you know exactly which code belongs to that mini-algorithm as it appears underneath it, slightly indented.

Now suppose we want to break down some of the tasks even further. We saw last month how *pay for drinks* could be broken down into:

```
open wallet
pass over money
receive change
```

and if this needs further explanation then *receive change* can become:

```
hold out hand
collect money
check amount
put change in pocket
```

Figure III shows these mini-algorithms put into our main piece of pseudocode. Have a good look at it as there's more to it than appears at first sight.

It might just look like a set of instructions and at one level this is what it is. However, it's a lot more than that.

It not only shows the instructions needed to achieve a goal (in this case get the editor to buy a drink) but it also shows how they go together. The major tasks are described broadly at the top left of the code.

These are given in fairly general terms. Any further explanation of these actions is shown in a mini-algorithm, whose title is underlined and indented for accuracy.

```
go to bar
buy drink
consume drink

go to bar
stand up
leave table
head towards counter
stop at bar

buy drink
catch eye of barman
order round
pay for drinks
stop crying
```

Figure I: Last month's Figure V

```
go to bar
buy drink
consume drink

    go to bar
      stand up
      leave table
      head towards counter
      stop at bar

    buy drink
      catch eye of barman
      order round
      pay for drinks
      stop crying
```

Figure II: Same algorithm, different style

```
go to bar
buy drink
consume drink

    go to bar
      stand up
      leave table
      head towards counter
      stop at bar

    buy drink
      catch eye of barman
      order round
      pay for drinks
      stop crying

        pay for drinks
          open wallet
          pass over money
          receive change

              receive change
                hold out hand
                collect money
                check amount
                put change in pocket
```

Figure III: Same algorithm, taken further

Notice that the further right a mini-algorithm starts, the more concerned with details it is, yet the less it actually does.

Difficult tasks are broken down into simpler tasks which are broken down into even simpler ones.

Flexible

The result is that the overall structure and relative importance of the various bits and pieces of the algorithm is shown pictorially in an easy-to-grasp form. You get to see the wood and then select the trees you're interested in.

I must point out that the way I indent and underline my Pseudocode is my way – there's no proper, defined way of doing it.

It's not a language like Basic or Pascal where the rules are strict and unforgiving. Pseudocode is meant to be a flexible, easy-to-use way of thinking about and designing programs.

If you spend more time thinking about a nicely indented layout than you do about the actual algorithm then you're missing the point. None of my Pseudocode ever looks as neat or is as complete as the examples shown here.

Having said that, do try to be consistent in whatever way you treat your Pseudocode.

You may not want to underline the titles of mini-algorithms or feel that an indentation of one space is enough. Fine and good, it's your Pseudocode. But whatever you do, apply your rules consistently and you'll help yourself enormously.

Easy to grasp

The only real rule with Pseudocode is clarity. There's nothing wrong with the algorithm in Figure IV, it does exactly the same job as the one in Figure III.

But is it as easy to grasp? A good layout makes the algorithm easier to understand and hence to use.

That's enough on indentation and layout for the moment. After all, Pseudocode is about writing programs so let's see how it can help us.

Figure V shows a piece of Pseudocode that allows us to find the average of two numbers.

The main algorithm is our universal

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calculation algorithm from last month. The rest of the Pseudocode describes how to deal with this particular computational problem.

```
go to bar

   go to bar
     stand up
     leave table
     head towards counter
     stop at bar

buy drink

   buy drink
     catch eye of barman
     order round
     pay for drinks
     stop crying

       pay for drinks
         open wallet
         pass over money
         receive change

           receive change
             hold out hand
             collect money
             check amount
             put change in pocket

consume drink
```

Figure IV: Same algorithm, different layout

As is plain from the code the screen is cleared and two numbers are requested. Then the calculation is done and finally the results displayed.

In this case there's only been one level below the main algorithm. Most programmers would be able to go straight from this to coding with no trouble.

However, it depends what language you're using as *request first number* is easy to do in Basic:

```
INPUT"Give me the first number",number1
```

but would be rather more difficult in assembler.

```
initialise
calculate
output

  initialise
    clear screen
    request first number
    request second number

  calculate
    add numbers
    divide by 2

  output
    clear screen
    print message
    display average
```

Figure V: An average piece of Pseudocode

In that case it might be best to break the code down further, making *request first number* a mini-algorithm which shows exactly how you mean to do it.

All of which shows one of the fundamental questions of using Pseudocode – how far do you go? How much detail should you go into before you translate the code into whatever language you're using?

In many ways it's a matter of taste and I'll deal with the question later. For the moment it's enough to say that you'll know when to stop writing Pseudocode and start entering your program at the keyboard.

Now let's cast our mind back to the problem we mentioned last month, getting our editor to buy more than one round.

So far all our code has been strictly sequential. There's been one instruction followed by another followed by another and so on. There's been no repetition.

Most programs, however, contain a lot of repetition and Pseudocode has several structures for dealing with this. Figure VI shows one of these, the FOR construction, in action.

All this does is describe how to print the line:

```
*/*/*/*/*/*/*/*/*/*/
```

which may not be very exciting but does show how FOR works. It takes the form:

```
FOR so many times DO
  whatever
  whatever
ENDFOR
```

and has the effect of repeating whatever statements come between the DO and ENDFOR for *so many times*.

```
display line

  display line
    for 10 times do
      write *
      write /
    endfor
```

Figure VI: The Pseudocode FOR loop

It's not all that different from Basic's FOR . . . NEXT loop so the concept should be easy to grasp.

Notice that in Figure VI I've indented the body of the loop, the bits between the DO and ENDFOR.

This isn't strictly necessary but I think it helps the reader to grasp what's happening, linking together all the statements that will be repeated.

Also you'll see that I haven't put FOR, DO and ENDFOR in capitals. Some people do, claiming that they can see the control structures more easily. I think that the indentation does the job just as well and don't bother. It's up to you.

```
display ten lines

  display ten lines
    for 10 times do
      display line
      move to new line
  endfor

  display line
    for 10 times do
      write *
      write /
    endfor
```

Figure VII: Two FORs in action

Until now we've been busy breaking our algorithms into ever smaller units. Let's go the other way and use *display line* in another piece of Pseudocode, this time one to produce 10 of the above lines. Figure VII shows the result.

I told you that Pseudocode was flexible, didn't I? Notice now that we've got a a pair of nested FOR loops.

If you can't see that, Figure VIII shows exactly the same algorithm with the code for *display line* substituted directly. You could, if you wanted, have your Pseudocode like this.

```
display ten lines

  display ten lines
    for 10 times do
      for 10 times do
        write *
        write /
      endfor
    move to new line
    endfor
```

Figure VIII: Another way of looking at things

I prefer Figure VII to Figure VIII. It's easier to grasp what it's doing and that's the whole point of Pseudocode.

And that's where we end for this time. As a challenge, try translating the average program and the line producing program into Basic and another language, maybe Pascal or Assembler.

Notice how very different looking listings can be produced from the same piece of Pseudocode.

● *That should keep you busy until next month when we'll look at some more Pseudocode structures. Hopefully we'll be able to get the editor to keep buying drinks while the pub is open, repeatedly getting rounds in until closing time.*

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Jeremy Brayshaw, BBC Telesoftware Organiser with the BBC Micro system teletext adapter

Ceefax: More than just a toy

Jeremy Brayshaw looks back as an old friend comes of age

Free software. That was the claim that originally aroused my interest in the BBC's Telesoftware service many years ago.

With around 15 files transmitted each week there is a vast range of software available for anyone – and it is all free. But there is much more to teletext than just free software . . .

I purchased my teletext adapter as soon as it was launched – in the days when it was quite expensive.

I was not familiar with the Ceefax system and it was an exciting and interesting venture to explore the ever-changing pages of teletext.

As with so many things, I prepared myself for the time when the novelty would wear off and my adapter would be left to gather dust in the corner of the room.

But with such a wide range of useful information so easily available, I soon realised that Ceefax was more than an electronic toy.

Several years later, and my adapter is still in constant use by the whole family. It has become an indispensable information source for many practical purposes and I would find it difficult now to be without it.

The ability to incorporate information taken from Ceefax within a computer program gives a new dimension to computer software.

At last my humble BBC Micro could perform serious and useful tasks and perhaps even win the pools for me.

Looking at the sports pages on Ceefax, I found all the information I needed about the football matches and teams. All I had to do was to write a program that took this information and used it in a pools prediction calculation.

With careful reference to my Teletext user guide I discovered the techniques needed to extract the required information from the pages and constructed an interactive program.

The prediction program worked and proved the reliability of Ceefax for information of a volatile nature.

Using the teletext adapter gives the computer a facility that cannot be achieved in any other practical way. It reliably finds all the league and match data for every game being played and processes it using an appropriate calculation.

Unfortunately my algorithm for deciding the outcome of each match is not as good as I had hoped and I haven't actually won anything yet, although many other people claim a worthwhile profit from the program.

As Ceefax covers such a wide subject area, interactive programs can be used for almost any application. For example, the major share prices are updated regularly throughout the day as part of the Ceefax financial service, and this seemed an appropriate area for investigation.

The resultant program offers the chance to create a personal portfolio of shares, real or fictitious, keeping a detailed account of progress by finding the correct share prices current at the time of running the program.

As the share prices are updated about every 90 minutes on Ceefax it is quite possible to make a healthy profit during the course of a day.

If you would like to try your hand on the stock market then this program is for you. Keep an eye on BBC2 Ceefax pages 710 and 712 for details of when it is available again.

The weather details provided the source for another software package, logging daily details and producing a monthly graph of weather trends.

TV programme listings, teletext indexes, financial information, recipes and news pages have all been the subject of interactive programs.

My interest in Ceefax and telesoftware led me to apply for the BBC Telesoftware Organiser's job. This came as a bit of a surprise to the BBC and particularly the existing Telesoftware Organiser who was not at that time ready to relinquish his post.

In due course, however, the position became available and I was invited to attend an interview. Having spent the previous 13 years as a teacher, working my way up from nothing to a state of extreme poverty, and still reeling from the effects of the English education system, I found it an exciting challenge to be a part of the vast BBC empire.

My appointment has given me the opportunity to study the Ceefax system in close detail. One of the many exciting forthcoming features from Telesoftware is a series of programming modules accompanied by detailed descriptions giving the techniques of interactive program writing.

In this I hope to impart some of the details about the Ceefax system, and how to get your computer to make efficient use of it.

The BBC has been involved with telesoftware for some time. Many years of research and experimentation were carried out before regular public transmissions started.

Let's take a look at how the telesoftware service began:

Experimental transmissions for a

Ceefax service started in 1972. Following this two-year trial, a full public information service began in 1974 but at this time did not include telesoftware broadcasts.

As the BBC's computer literacy project got under way the Ceefax system seemed an ideal medium for the distribution of related information and software and so the subject was investigated.

An integrated computer package was required and the BBC microcomputer system, which included a teletext adapter, was designed and produced.

It was soon realised that extra features would have to be incorporated into the existing teletext transmissions in order to provide telesoftware broadcasts. There were two main problems to be overcome:

First, teletext uses only 127 different character codes. Computers, however, use 255 different codes. Some method had to be found of transmitting all the additional ones.

Secondly, it is important that any errors in the reception of computer software can be detected by the receiver. A checking system applying to all the information on the page had to be devised.

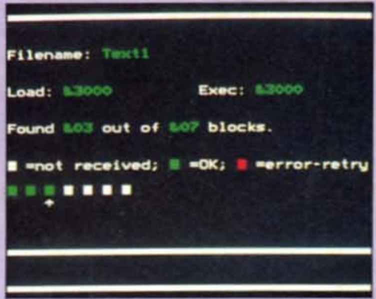
The problems were considered by the BBC research engineers and they designed a protocol for telesoftware transmission that would solve these and a few other difficulties.

Experimentation in telesoftware transmission lasted several years. Mullard had designed and built a prototype receiver for use in the initial research.

This consisted of a 22 inch colour television set permanently linked to a Mullard microcomputer system. The computer was a single box housing a Z80 processor with 32k ram and a 24k Basic rom.

Receiving files from the broadcast needed a separate downloading program to be run. This restricted downloading to Basic programs only (in Ascii format), although the protocol allowed for any type of file to be transmitted. Using this equipment, the Brighton Polytechnic embarked upon a major project using both BBC and ITV teletext transmissions to determine the feasibility of the system.

The original Mullard Telesoftware receiver – permanently connected



```
Filename: Text1

Load: &3000          Exec: &3000

Found &03 out of &07 blocks.

■ =not received; ■ =OK; ■ =error-retry
■ ■ ■ ■ ■ ■ ■
```

Telesoftware program downloader

Education, in particular the secondary sector, was chosen as the target for the new experimental service. Nine schools from seven education authorities were selected to take part, and care was taken to ensure they represented an accurate cross-section of the 6,000 or so state secondary schools in the country.

Between September 1981 and June 1982 the schools in the scheme received a variety of educational software from both Ceefax and Oracle for assessment.

These early broadcasts included some interactive software which took the current food prices from Ceefax pages and used them in software designed for domestic science lessons.

Several minor problems with both software and hardware were discovered. Even so, the trials were very successful.

The design of the BBC microcomputer system's Acorn adapter was by now well under way. The protocol was refined in the light of experiences gained and these changes made a firm foundation for the next series of tests.

The final version of the protocol specification was agreed by the appropriate international standards committee (CCIR). It provides a range of facilities extra to the normal teletext broadcast and enables efficient transmission of long files.

This protocol, known as the Redefinable Telesoftware Format (RTF) has been used without alteration by the BBC ever since.

Following the success of the Telesoftware in Secondary Education project, the Brighton Polytechnic team turned their attentions to the primary school sector. This project, which began in 1982, involved 40 of the 25,000 or so state primary schools.

The original Mullard receivers were by now obsolete, so the participating schools were issued with prototype Acorn adapters for use with their existing BBC Micros.

The equipment proved extremely reliable and versatile and offered far greater mobility than had been possible previously.

The results from these two projects were very encouraging and led to the introduction of a full public Ceefax telesoftware service from September 1983. It now offers unrivalled facilities both for schools and for non-educational situations.

The BBC Telesoftware service is free and offers a regularly changing range of programs, notes, reviews and computing news items. And to receive it all you need is a teletext adapter connected to a home micro.

Adapters are available for a range of computers, but remember the BBC transmissions conform to the internationally agreed RTF protocol. Not all adapters implement this standard fully, so it is worth checking this point before purchase.

The adapter needs a good quality aerial connection to receive the teletext signals. The computer can then be used as an enhanced teletext receiver, displaying teletext pages from any channel.

A separate teletext television set is not needed. It is not possible to connect a computer directly to an existing teletext TV set.

If you are thinking of buying an Acorn adapter (or if you already own one) then I strongly recommend you purchase the Advanced Teletext System rom (ATS) to control it. Both the adapter and ATS are available on special offer on Page 44.

The ATS provides very easy to use facilities. Even my non-technical family find using the ATS software far easier than using our standard teletext television.

Telesoftware has come a long way since those early experimental days. Take a look now at what's going on – BBC2 Ceefax, page 700 onwards. ■

BBC CEEFAX

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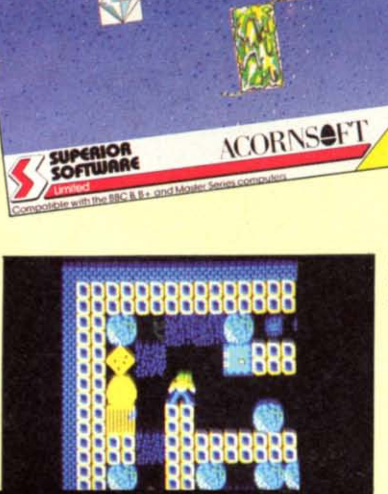
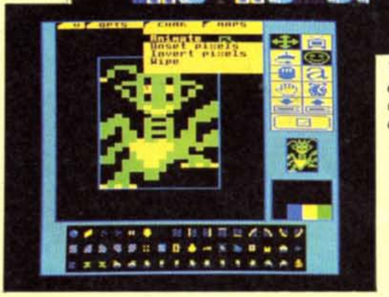


Design a screen then playtest it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TO ORDER TURN TO THE FORM ON PAGE 159

Roland Waddilove continues his series on machine code arcade games

On the track of sprites

MACHINE CODE GAMES

Part 4

IN the last two articles we looked at three different methods of detecting collisions between sprites. Now it is time to move on and this month we'll be seeing how to implement tracking sprites.

Once set in motion these characters will automatically follow a preset pattern round the screen.

You may be wondering why we should need such sprites when writing arcade games. Well, they are more common than you may think.

The ghosts in Pac Man follow a pattern around the maze, so do the aliens in Arcadians as they swoop down. Perhaps the best example of this class of sprites are the aliens in Galaforce – the game Kevin Edwards wrote for Superior Software last year.

In this game aliens stream in from off the edge of the screen, perform an amazing pattern and zoom off again, exploding as they reach the edge. And what is more, each new level brings a new wave of aliens with an even more intricate pattern.

The prospect of programming this may seem daunting, but as we'll see it is in fact fairly straightforward if you go about it in the right way.

Faced with a task like this it is vital that you plan your program and data very carefully. It's so easy to become entangled with spaghetti-like code with pages and pages of data.

Before you put finger to keyboard the structure of the pattern data must be worked out. I'm not talking about the data itself here, but the way it is to be stored in memory.

This must be done before any code has been entered into the micro – you can't write the program unless you know how the data is structured.

Of course, there's more than one way to skin a cat and I can't possibly go through all the possible data structures. Here is just one solution, using a single byte to specify each point in the pattern

Imagine a sprite currently at the coordinates x1,y1, following a pattern on the screen.

There are two ways to specify its next position, x2,y2. We can either provide the absolute coordinates to move to or give it the new coordinates relative to its current position.

Sprites normally move in small steps, often a byte at a time. So, the new coordinate relative to the current position will always be a small number.

If we restrict the relative movement to the range 0 to 3, 3 being ¾ of a normal mode 2 character's width, only two bits are required to store the offset. Remember that the movement can be positive or negative so an extra bit is necessary to hold the sign.

This means that the new coordinates can be stored in six bits, three for the x displacement and three for the y. Since there are eight bits in a byte this leaves two bits free.

One of the spare bits can determine whether a bomb is to drop or some other action is to occur and the remaining bit can be a GOTO bit – causing a jump to another part of the pattern.

Take a look at Figure I, which shows the structure of the pattern data. Bits 0 to 2 and 3 to 5 are the signed x and y coordinates relative to the current position.

If bit 6 is set a bomb is dropped at this point in the pattern and bit 7 means GOTO – the numbers stored in bits 0 to 6 are subtracted from the current position in the pattern.

For instance, a pattern byte of &85 would mean go back five bytes in the pattern. This enables a sprite to repeat a section, fly in circles or go back to the start.

There are certain values of the pattern byte that will never occur – 4, 32 and 36. In binary 4 is %00000100 indicating an x offset of –0, which is meaningless. Similarly –0 for y and –0 for both x and y should not arise.

These numbers can be treated as special cases. All indicate the end of the pattern in one way or another, 4 means the sprite is to explode at this point, 32 means remove it from the screen and 36 means turn it into a kamikazi sprite so it will make a beeline straight for you.

The two bytes at the beginning of a pattern hold the absolute x and y coordinates of the start position. The pattern itself starts at byte two and ends with one of the special cases outlined above or a GOTO.

As you can see it is possible to cram a mass of information into just one byte. This is vital on the BBC range of micros as there is only about 10k of ram to play around with in modes 0, 1 and 2.

Now we can move on to the data structure for the sprites themselves.

Each sprite requires a six byte block of memory – two for the absolute coordi-

Turn to Page 134 ▶

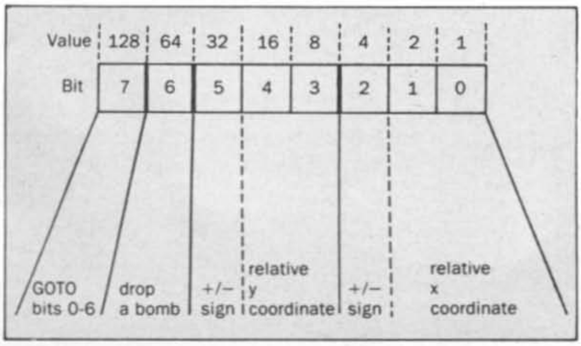

Figure I: The structure of the pattern byte

Byte Function
0 = flags
1 = pattern pointer
2 = x coordinate
3 = y coordinate
4/5 = screen address

Flags
Flags
bit 0 = on screen
bit 1 = exploding
bit 2 = dead
bit 3 = start exploding

Figure II: The sprite information block

◀ *From Page 133*

nates, two for the screen address, one for a pointer to the current position in the pattern and one for various flags. Figure II shows the sprite information block that I use.

Bit 0 of the flags indicates whether the sprite is on the screen. Bit 1 means it is exploding and bit 3 means start it exploding. Bit 2 means it is dead.

It is convenient to store all the blocks in one page of memory and index into them using the X and Y registers. This means that there can be up to 256/6 or 42 tracking sprites on the screen.

It's now time to put the theory into practice so enter and save this month's listing.

When you run it you'll first be asked for the spacing between the sprites. Try 7 to start off. At the next prompt enter the number of sprites, remembering that you can only have 42 at most.

The screen will clear and you'll see a stream of aliens flying in from the top left corner of the screen. They'll loop round the bottom and zoom off, disappearing at the top right of the screen.

Press Escape and run it again, experimenting with the spacing and number of sprites.

The structure of the data makes the programming less difficult than you might first have thought, having just seen the demonstration.

There are several points to watch out for when writing this sort of routine. Firstly all the sprites are off the screen when the program is first run and must be printed at the start position one at a time.

Only those sprites on the screen are moved and these are recognised by having bit zero of their flags byte set.

When putting sprites on the screen it's important not to confuse those that have finished the pattern and have been taken off the screen. These are recognised by having bit 2 of their flags byte set.

Only one sprite at a time can be printed at the start position and before the next one is printed the last one must have moved out of the way.

This is the spacing between the sprites. Try the demonstration with a spacing of one and you'll see the problems that can occur.

The solution is to have a timer. This counts down the next sprite to be put on the screen.

Finally, try designing your own patterns and replace the data statements at the end of the listing with your own. Take note of how the data is structured and it's up to you to make sure that the sprites stay within the confines of the screen limits.

● *That's all for now. There is plenty here to get your teeth into and it should keep you busy until next month when we'll move on to bouncing sprites.*

```
   10 REM Tracking Sprites
   20 REM By R.A.Waddilove
   30 REM (c) Micro User
   40 MODE 7:*TV0,1
   50 IF PAGE<>&1900 PRINT"PAGE must be
&1900":STOP
   60 RESTORE 1730:FOR I%=0 TO 47:READ J
%:I%?&C00=J%:NEXT
   70 pattern=&900:balls=&A00
   80 RESTORE 1760:I%=0:REPEAT:READ J%:I
%?pattern=J%:I%=I%+1:UNTIL J%<0
   90 INPUT"Space between balls(1-20):"
space
  100 INPUT"Number of balls(1-40):"numb
er-of-balls
  110 PROCassemble:CLEAR
  120 MODE 2:CALL &1100
  130 END
  140
  150 DEF PROCassemble
  160 old=&70:new=&72:rows=&74:columns=&
75:temp=&76:temp1=&78
  170 delay=&7B
```

Turn to Page 137 ▶

Microdis

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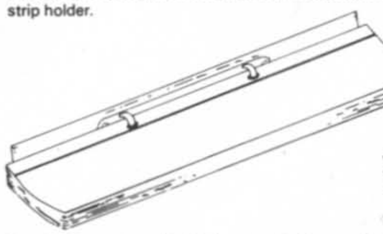

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◀ From Page 134

```
  180 ball-at-start=&7C
  190 ball-number=&7D
  200 osbyte=&FFF4
  210 FOR pass=0 TO 2 STEP 2
  220 P%=&1100
  230 [ OPT pass
  240 .initialise
  250 LDA #space:STA delay
  260 LDA #0:TAX
  270 .loop
  280 STA balls,X  \initialise balls
  290 DEX:BNE loop
  300 .main-loop
  310 JSR move-balls
  320 DEC delay:BPL not-time
  330 LDA #space:STA delay
  340 .not-time
  350 LDA #&81:LDX #256-113:LDY #&FF:JSR
 osbyte  \Escape?
  360 TYA:BEQ main-loop
  370 RTS
  380
  390 .move-balls
  400 LDA #0:STA ball-at-start  \one new
 ball at a time
  410 LDX #number-of-balls*6
  420 LDA &240:.fx19 CLI:SEI:CMP &240:BE
Q fx19
  430 .mbloop
  440 STX ball-number
  450 LDA balls,X:AND #1:BNE on-screen
  460 JSR new-ball:JMP next-ball
  470 .on-screen
  480 LDA balls,X:AND #10:BEQ move-it
  490 JSR explode:JMP next-ball
  500 .move-it
  510 LDA data:STA olddata+1:STA newdata
+1:LDA data+1:STA olddata+2:STA newdata+
2
  520 LDA balls+4,X:STA old:LDA balls+5,
X:STA old+1 \old address
  530 JSR get-new-xy
  540 LDY balls+3,X:LDA balls+2,X:TAX:JS
R convert \new address
  550 LDX ball-number
  560 LDA new:STA balls+4,X:LDA new+1:ST
A balls+5,X  \store it
  570 JSR print
  580 .next-ball
  590 LDA ball-number:SEC:SBC #6:TAX
  600 BNE mbloop
  610 CLI
  620 RTS
  630
  640 .get-new-xy
  650 LDY balls+1,X:INC balls+1,X  \patt
ern index
  660 LDA pattern,Y
  670 CMP #32:BNE ex1:JMP remove
  680 .ex1
  690 CMP #4:BNE ex2:LDA #9:STA balls,X:
RTS  \explode next time
  700 .ex2
  710 CMP #36:BNE moving:JMP kamikasi
  720 .moving
  730 LDA pattern,Y:AND #4:BEQ xplus  \l
eft or right?
  740 LDA pattern,Y:AND #3:STA temp:SEC:
LDA balls+2,X:SBC temp:JMP got-x
  750 .xplus
  760 LDA pattern,Y:AND #3:CLC:ADC balls
+2,X
  770 .got-x
  780 STA balls+2,X
  790 LDA pattern,Y:AND #32:BEQ yplus  \
up or down?
  800 LDA pattern,Y:LSR A:LSR A:AND #6:S
TA temp:SEC:LDA balls+3,X:SBC temp:JMP g
ot-y
  810 .yplus
  820 LDA pattern,Y:LSR A:LSR A:AND #6:C
LC:ADC balls+3,X
  830 .got-y
  840 STA balls+3,X
  850 RTS
  860
  870 .remove
  880 LDA #4:STA balls,X  \dead
  890 LDA &80:STA new:STA new+1:JSR prin
t \off screen
  900 PLA:PLA:JMP next-ball
  910
  920 .explode
  930 \Write it yourself!
  940 RTS
  950
  960 .kamikasi
  970 \Write it yourself!
  980 RTS
  990
 1000 .new-ball
 1010 LDA delay:BNE no-ball
 1020 LDA ball-at-start:BNE no-ball
 1030 LDA balls,X:AND #4:BNE no-ball  \d
ead?
 1040 INC ball-at-start  \no more
 1050 LDA #1:STA balls,X  \on screen
```

This is one of hundreds of programs now available FREE for downloading on MicroLink

```
 1060 LDA #2:STA balls+1,X  \pattern sta
rt
 1070 LDA pattern+1:STA balls+3,X:TAY:LD
A pattern:STA balls+2,X:TAX \start x,y
 1080 JSR convert
 1090 LDX ball-number
 1100 LDA new:STA balls+4,X:LDA new+1:ST
A balls+5,X  \store address
 1110 LDA data:STA newdata+1:LDA data+1:
STA newdata+2
 1120 JMP put
 1130 .no-ball
 1140 RTS
 1150
 1160 .put
 1170 LDA #&80:STA old:STA old+1
 1180 .print
 1190 LDA #4:STA columns
 1200 LDX #0:LDY #0
 1210 LDA new:STA temp1:LDA new+1:STA te
mp1+1
 1220 LDA old:STA temp:LDA old+1:STA tem
p+1
 1230 .loop1
 1240 LDA #12:STA rows
 1250 .loop2
 1260 .newdata LDA &3000,X:EOR (new),Y:S
TA (new),Y
 1270 .olddata LDA &3000,X:EOR (old),Y:S
TA (old),Y
 1280 INX
 1290 LDA old:AND #7:CMP #7:BEQ bottom1
 1300 INC old:BNE next1:INC old+1:JMP ne
xt1
 1310 .bottom1
 1320 CLC:LDA old:ADC #&79:STA old:LDA o
ld+1:ADC #2:STA old+1
 1330 .next1
 1340 LDA new:AND #7:CMP #7:BEQ bottom2
 1350 INC new:BNE next2:INC new+1:JMP ne
xt2
 1360 .bottom2
 1370 CLC:LDA new:ADC #&79:STA new:LDA n
ew+1:ADC #2:STA new+1
 1380 .next2
 1390 DEC rows:BNE loop2
 1400 CLC:LDA temp1:ADC #8:STA new:STA t
emp1:LDA temp1+1:ADC #0:STA new+1:STA te
mp1+1
 1410 LDA temp:ADC #8:STA old:STA temp:L
DA temp+1:ADC #0:STA old+1:STA temp+1
 1420 DEC columns:BNE loop1
 1430 RTS
 1440
 1450 .data OPT FNequw(&C00)
 1460
 1470 .convert   \X,Y -> address
 1480 LDA #0:STA new+1:TXA:ASL A:ASL A:R
OL new+1:ASL A:ROL new+1:STA new \X*8
 1490 TYA:AND #7:ADC new:STA new:LDA new
+1:ADC #0:STA new+1 \ +(Y MOD 8)
 1500 TYA:LSR A:LSR A:LSR A:ASL A:TAY  \
2*(Y DIV 8)
 1510 LDA table,Y:ADC new:STA new:LDA ta
ble+1,Y:ADC new+1:STA new+1
 1520 RTS
 1530
 1540 .table OPT FNtable
 1550 ]
 1560 NEXT
 1570 ENDPROC
 1580
 1590 DEF FNequw(word)
 1600 ?P%=word MOD256
 1610 P%?1=word DIV256
 1620 P%=P%+2
 1630 =pass
 1640
 1650 DEF FNtable
 1660 FOR I%=0 TO 31
 1670 ?P%=(&3000+I%*&280)MOD256
 1680 P%?1=(&3000+I%*&280)DIV256
 1690 P%=P%+2
 1700 NEXT
 1710 =pass
 1720
 1730 REM Ball data...X=4/Y=12
 1740 DATA 0,1,1,3,15,7,7,15,3,1,1,0,3,3
,3,3,15,15,15,15,3,3,3,3,7,3,3,3,15,7,7,
15,3,3,3,7,0,2,2,3,15,15,15,15,3,2,2,0
 1750 REM ******* Pattern Data *******
 1760 DATA 0,8
 1770 DATA 27,27,27,27,27,27,27,27,27
 1780 DATA 27,27,27,27,27,26,26,26,26
 1790 DATA 17,17,17,17,17,17,17,17,17
 1800 DATA 16,16,16,16,8,8,8,8,8,8,8
 1810 DATA 5,5,5,6,6,6,7,7,7,7,7,7,7
 1820 DATA 6,6,6,5,5,5,40,40,40,40,40
 1830 DATA 40,40,48,48,48,48,49,49,49
 1840 DATA 49,49,49,49,49,49,58,58,58
 1850 DATA 58,59,59,59,59,59,59,59,59
 1860 DATA 59,59,59,59
 1870 DATA 32,-1
```

This listing is included in this month's cassette tape offer. See order form on Page 159.

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```
   10 REM ***********************
   20 REM *     Hunkie-Egg      *
   30 REM *   by G.J.Key 1987   *
   40 REM * (c) The Micro User *
   50 REM ***********************
   60 *FX3
   70 IFTOP>&3000MODE7:PROCshorten:ELSEM
ODE2
   80 PROCinit
   90 ONERRORCALLQ%:CLS
  100 PROCgame
  110 END
  120 DEFPROCgame:s%=0:PROChisc
  130 REPEAT:s%=0:h%=0:r%=1:l%=5
  140 V%=3:PROCscn:PROCon
  150 REPEAT:PROCpl:REPEAT
  160 PROCb:CALLP%,a%(T%),b%(T%),T%
  170 PROCi:CALLP%,X%,Y%,M%
  180 UNTIL?p%>7
  190 FORI%=1TO10
  200 SOUND1,3,130,3-(I%=10)*7
  210 M%=M%+1:IFM%=10M%=7
  220 CALLP%,X%,Y%,M%
  230 REPEATUNTILADVAL-6=15
  240 NEXT:l%=l%-1:CALLQ%
  250 PROCstart:IFl%PROCon
  260 UNTILl%=0
  270 FORT%=0TO1:GCOL3,129:CLG:NEXT
  280 GCOL0,128:COLOUR5:PRINTTAB(5,15);
  290 FORT%=1TO10:PRINTMID$("GAME  OVER"
,T%,1);:SOUND1,4,150,5:REPEATUNTILADVAL-
6=15:NEXT:TIME=0:REPEATUNTILTIME>200:PRO
Cscrol
  300 PROChisc
  310 UNTIL0
  320 ENDPROC
  330 DEFPROCon:FORI%=0TOV%-1
  340 CALLP%,a%(I%),b%(I%),I%:SOUND1,4,1
80,8:REPEATUNTILADVAL-6=15:NEXT:CALLP%,X
%,Y%,M%:?p%=0
  350 ENDPROC
  360 DEFPROCb
  370 T%=T%+1:IFT%=V%T%=FALSE
  380 IFT%<3PROCt:ENDPROC
  390 IFT%>4PROCs:ENDPROC
  400 IFf%(T%)a%(T%)=a%(T%)+c%(T%):b%(T%
)=b%(T%)+d%(T%):f%(T%)=f%(T%)-1:ENDPROC
  410 W%=B%?e%(T%)
  420 IFW%=3e%(T%)=e%(T%)+18:c%(T%)=FALS
E:d%(T%)=2:f%(T%)=5:ENDPROC
  430 IFW%=4ORW%=7IFb%(T%)-3<Y%e%(T%)=e%
(T%)+18:c%(T%)=FALSE:d%(T%)=1:f%(T%)=10:
ENDPROC
  440 IFW%>4IFb%(T%)-3>Y%e%(T%)=e%(T%)-1
8:c%(T%)=FALSE:d%(T%)=TRUE:f%(T%)=10:END
PROC
  450 IFc%(T%)=0c%(T%)=SGN(X%-a%(T%))
  460 d%(T%)=FALSE:IFa%(T%)=0:c%(T%)=1
  470 IFa%(T%)=64:c%(T%)=TRUE
  480 e%(T%)=e%(T%)+c%(T%):f%(T%)=4
  490 ENDPROC
  500 DEFPROCs
  510 IFY%=b%(T%)-3c%(T%)=2*SGN(X%-a%(T%
))
  520 a%(T%)=a%(T%)+c%(T%)
  530 IFa%(T%)=60c%(T%)=FALSE
  540 IFa%(T%)=FALSE c%(T%)=FALSE
  550 ENDPROC
  560 DEFPROCt
  570 a%(T%)=a%(T%)+c%(T%):IFa%(T%)<2c%(
T%)=-c%(T%):ENDPROC
  580 IFa%(T%)>66c%(T%)=-c%(T%)
  590 ENDPROC
  600 DEFPROCi
```

```
  610 IFJ%PROCj:ENDPROC
  620 U=Y%*Y:u%=U=INTU:IFu%PROCl
  630 S=X%*X:S%=S+INTU*18:Z%=B%?S%
  640 IFS<>INTS PROCh:ENDPROC
  650 IFZ%=3J%=TRUE:ENDPROC
  660 IFu%IFZ%>3PROCu:ENDPROC
  670 IFH%<10PROCcl:ENDPROC
  680 DEFPROCh
  690 IFNOTINKEYU%ENDPROC
  700 IFZ%=3ENDPROC
  710 J%=1:E%=5:j%=TRUE:x%=FALSE
  720 IFINKEYL%x%=TRUE
  730 IFINKEYR%x%=1
  740 ENDPROC
  750 DEFPROCj
  760 IFJ%=TRUE:PROCk:ENDPROC
  770 IFX%=0ORX%=68x%=FALSE
  780 IF(X%AND3)=0IF?p%=7PROCbel(150):GC
OL3,6:MOVE64+X%*16,991-INTU*160:VDU5,129
,4:s%=s%+10*r%:PRINTTAB(6,31);s%;:h%=h%+
1:IFh%=g%PROCns:ENDPROC
  790 Y%=Y%+j%:X%=X%+x%:J%=J%+1:IFJ%=5AN
DINKEYU%j%=0:E%=9:ELSEIFJ%=E%j%=1ELSEIFJ
%=E%+4J%=TRUE
  800 ENDPROC
  810 DEFPROCk
  820 IFB%?(INT(Y%*Y)*18+X%*X)=3Y%=Y%+2:
SOUND&12,1,250-Y%*4,1:ENDPROC:ELSEJ%=FAL
SE:ENDPROC
  830 DEFPROCns
  840 h%=0:r%=r%+1:CALLQ%:PROCscrol
  850 IFV%=3V%=5ELSEV%=V%+1:IFV%=8V%=7
  860 PROCscn:PROCon
  870 ENDPROC
  880 DEFPROCscrol:I%=0:FORT%=0TO76STEP2
:VDU23;13,T%;0;0;0;28,I%,31,T%DIV4,0,12:
PROCbel(T%*3):I%=T%DIV4:NEXT:VDU26,12:EN
DPROC
  890 DEFPROCcl
  900 IFINKEYU%Y%=Y%-1:M%=9:H%=H%+1AND15
:SOUND&10,2,5,1:ENDPROC
  910 IFINKEYD%Y%=Y%+1:M%=9:H%=H%-1:SOUN
D&10,2,5,1:IFH%=0H%=10
  920 ENDPROC
  930 DEFPROCl
  940 IFINKEYL%IFX%>0X%=X%-1:M%=8:SOUND&
10,2,4,1
  950 IFINKEYR%IFX%<68X%=X%+1:M%=7:SOUND
&10,2,4,1
  960 ENDPROC
  970 DEFPROCu
  980 IFZ%=4ORZ%=7IFINKEYD%Y%=Y%+1:M%=9:
H%=9:SOUND&10,2,5,1:ENDPROC
  990 IFZ%>4IFINKEYU%Y%=Y%-1:M%=9:H%=1:S
OUND&10,2,4,1:ENDPROC
 1000 PROCh
 1010 ENDPROC
 1020 DEFPROCmode(M%)
 1030 VDU22,M%,23;8202;0;0;0;
 1040 FORT%=0TO7:VDU19,T%+8,T%;0;:NEXT
 1050 VDU19,12,8;0;19,14,15;0;19,8,4;0;
 1060 ENDPROC
 1070 DEFPROCinit
 1080 p%=&75:p%?1=1:L%=-98:R%=-67:U%=-73
:D%=-105
 1090 Q=RND(-TIME):DIMa%(6),b%(6),c%(6),
d%(6),e%(4),f%(6),hs%(10),hs$(10):B%=&16
00
 1100 FORT%=1TO10:hs%(T%)=(11-T%)*500:hs
$(T%)="HUNKIE-EGG":NEXT
 1110 ENDPROC
 1120 DEFPROChisc:PROChead
 1130 PROCmup:PROCbel(120)
 1140 PRINTTAB(0,3)FNlines:FORT%=0TO11
 1150 PRINTTAB(32,5+T%)CHR$156TAB(7,5+T%
)CHR$129CHR$157CHR$135;:IFT%MOD11PRINThs
$(T%)STRING$(20-LENhs$(T%)-LENSTR$hs%(T%
),".");hs%(T%);"  "
 1160 NEXT:PRINT''FNlines
 1170 IFI%<>TRUE PROCgname
 1180 PROCbel(120):PRINTTAB(6,22)CHR$136
"PRESS THE SPACE BAR TO PLAY":REPEATUNTI
LINKEY-99
 1190 PROCbel(100):PROCmode(2)
 1200 ENDPROC
 1210 DEFPROCbel(N%):SOUND&11,4,N%,10:EN
DPROC
 1220 DEFPROChead:PROCmode(7)
 1230 FORT%=0TO1:PRINTTAB(11,T%)CHR$141C
HR$132CHR$157CHR$135"HUNKIE-EGG  "CHR$15
6:NEXT
 1240 ENDPROC
 1250 DEFPROCmup
 1260 IFs%<=hs%(10):I%=TRUE:ENDPROC
 1270 I%=10:REPEAT:IFhs%(I%-1)<s%:hs%(I%
)=hs%(I%-1):hs$(I%)=hs$(I%-1):I%=I%-1
 1280 UNTILI%=1ORhs%(I%+(I%<>FALSE))>=s%
 1290 hs%(I%)=s%:hs$(I%)=STRING$(10,".")
 1300 ENDPROC
 1310 DEFPROCgname
 1320 PROCbel(160):PRINTTAB(8,22)CHR$136
"PLEASE ENTER YOUR NAME"
 1330 T%=0:$&380=hs$(I%)
 1340 PRINTTAB(9,5+I%)CHR$131;:*FX21
 1350 REPEAT:i%=GET:IFi%=13hs$(I%)=$&380
:UNTILTRUE:PRINTTAB(9,5+I%)CHR$135:ENDPR
OC:ELSEIFi%<32ORi%>127UNTILFALSE
 1360 IFT%<10ANDi%<>127VDUi%:T%?&380=i%:
T%=T%+1
 1370 IFT%>0ANDi%=127VDU8,46,8:T%=T%-1:I
FT%<>10T%?&380=46
 1380 UNTILFALSE
 1390 ENDPROC
 1400 DEFFNlines:=CHR$146+STRING$(38,CHR
$243)
 1410 DEFPROCscn
 1420 CLS:COLOUR1:COLOUR131:RESTORE
 1430 FORT%=0TO29:IFT%<20PRINTTAB(T%,0)C
HR$131TAB(T%,30)CHR$131;
 1440 PRINTTAB(0,T%)CHR$131TAB(19,T%)CHR
$131;:NEXT
 1450 COLOUR6:COLOUR128:PRINTTAB(1,1);:F
ORT%=0TO17:VDU129:NEXT:g%=18
 1460 B%=&1600+((r%-1)MOD5)*108
 1470 FORT%=0TO5:PRINTTAB(1,5+T%*5);
 1480 FORI%=0TO17
 1490 PROCdraw(?(B%+18*T%+I%))
 1500 NEXT:NEXT:VDU24,0;0;1279;39;16,26
 1510 COLOUR7:COLOUR128:PRINTTAB(0,31)"S
CORE:";s%;SPC(7-LENSTR$s%)"LIVES:";:PROC
pl
 1520 DEFPROCstart
 1530 FORT%=0TO2:a%(T%)=0+T%*33:b%(T%)=1
3+T%*10:c%(T%)=2+(T%=1)*3:NEXT
 1540 FORT%=3TO4:a%(T%)=28-(T%=3)*16:b%(
T%)=3:c%(T%)=1+(T%=4)*2:d%(T%)=0:e%(T%)=
a%(T%)DIV4:f%(T%)=0:NEXT
 1550 FORT%=5TO6:a%(T%)=0:b%(T%)=3-40*(T
%=5):c%(T%)=0:d%(T%)=0:NEXT
 1560 X%=68:Y%=50:M%=8:X=.25:Y=.1
 1570 H%=15:J%=FALSE:T%=FALSE:J%=FALSE
 1580 ENDPROC
 1590 DEFPROCpl:GCOL0,7:MOVE1279,31:VDU5
,&7F,48+l%,4:ENDPROC
 1600 DEFPROCdraw(M%)
 1610 IFM%=255B%=&1600:M%=?B%
 1620 IFr%>5IFT%<5IFM%=2M%=1
 1630 LOCALi%
 1640 ONM%GOTO1650,1660,1670,1680,1650,1
660,1680
 1650 VDU10,17,128,17,6,129,11,8:g%=g%+1
 1660 VDU17,1,17,131,128:ENDPROC
 1670 COLOUR128:VDU32:ENDPROC
 1680 COLOUR8:COLOUR128:FORi%=1TO5:VDU13
2,10,8:NEXT:PRINTTAB(I%+2,5+T%*5);
 1690 ENDPROC
 1700 THEEND
 1710 DEFPROCcode:FORT%=0TO2STEP2
 1720 x=&70:y=&71:sno=&72:gone=&73:nm=&7
4:c=&75:q=&76:b=&77:w=&80:h=&92:total=&9
3:flag=&94:yst=&95:rwn=&96:P%=&E00:e=&C0
00
 1730 [OPTT%:LDX#7:LDY#11:.l
 1740 LDA&600,Y:STAw,X:DEX:DEY
 1750 LDA&600,Y:STAw,X:DEY:DEY:DEX
 1760 BPLl:LDY#0:STYgone:LDA(w),Y
 1770 BMIoffsc:CLC:ADC#4:STAx:CMP#73
 1780 BCConsc:.offsc:LDA#255:STAgone
 1790 .onsc:LDA(w+2),Y:ASLA:ASLA:CLC
 1800 ADC#16:STAw:LDA(w+4),Y:STAsno
 1810 .rem:STYy:LDX#3:.lp1:ASLx:ROLy
 1820 DEX:BNElp1:LDAw:AND#7:CLC:ADCx
 1830 STAx:BCCnh:INCy:.nh:LDAw:LSRA
 1840 LSRA:AND#254:TAX:CLC:LDAr,X
 1850 ADCx:STAx:INX:LDAr,X:ADCy:STAy
 1860 LDAsno:CMP#7:BCCot:SBC#7:JMPm
 1870 .ot:SEC:ROLA:TAX:STXsno:LDY#1
 1880 .lp2:LDAsol,X:STAw,Y:LDAsdp,X
 1890 STAs+1,Y:LDAsh,X:STAw+2,Y:DEX
 1900 DEY:BPLlp2:JSRpit:LDXsno:LDY#1
 1910 .cl:LDAx,Y:STAw,Y:STAsol,X:DEX
 1920 DEY:BPLcl:LDAgone:BNEby:.pit
 1930 LDXw+3:LDAw:AND#248:STArwn:LDAw
 1940 AND#7:STAyst:LDAw+1:STArwn+1
 1950 .l1:LDAw+2:STAh:LDArwn:STAw+4
 1960 LDYyst:LDArwn+1:STAw+5:.l2
 1970 LDA(w+4),Y:.s2:BNEbu:.s:EORe,X
 1980 STA(w+4),Y:DEX:BEQbyby:.on:DECh
 1990 BEQon2:INY:CPY#8:BNEl2:CLC
 2000 LDAw+4:ADC#&80:STAw+4:LDAw+5
 2010 ADC#2:STAw+5:LDY#0:BEQl2:.on2
 2020 CLC:LDArwn:ADC#8:STArwn:BCCl1
 2030 INCrwn+1:.pnh:JMPl1:.byby:RTS
 2040 .by:LDA#&C0:INX:INX:STAsol,X
 2050 RTS:.bu:BITb:BEQs:PHA:ORAc:STAc
 2060 PLA:BNEs:.m:TAX:BEQnou:CMP#1
 2070 BNEtwo:LDA#3:BNEnou:.two:LDA#6
 2080 .nou:STAw:LDAx:CMPmoloc:BNEmvd
 2090 LDAy:CMPmoloc+1:BEQstill:.mvd
 2100 INCq:.still:LDAq:AND#3:STAq:TAX
 2110 LDAwd,X:CLC:ADCw:LDXnm:SEC:ROLA
 2120 STAnm:LDY#0:STYc:INY:.mlp1
 2130 LDAmoloc,Y:STAw,Y:LDAmdp,X
```

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```
 2140 STAs+1,Y:LDAmht,Y:STAw+2,Y:DEX
 2150 DEY:BPLmlp1:LDA#19:JSR&FFF4
 2160 LDAy:CMP#&3A:BCSntop:LDX#5:.dl
 2170 NOP:INY:BNEdl:DEX:BNEdl:.ntop
 2180 JSRpit:.cln2:LDXnm:LDY#1:.mlp2
 2190 LDAmdp,X:STAs+1,Y:LDAx,Y:STAw,Y
 2200 STAmoloc,Y:LDAgb,Y:STAs2,Y:DEX
 2210 DEY:BPLmlp2:LDAgone:BEQpeek
 2220 LDA#&C0:STAmoloc+1:RTS:.peek
 2230 JSRpit:LDA#&EA:STAs2:STAs2+1
 2240 LDAy:CMP#&3A:BCCnbot:LDX#4:.dl2
 2250 NOP:INY:BNEdl2:DEX:BNEdl2:.nbot
 2260 LDA#0:STAw:LDX#4:.sl ASLc:ROLA
 2270 ASLc:ROLw:DEX:BNEsl:ORAw:STAc
 2280 RTS:.Q%:LDA#10:PHA:.ofl:PLA
 2290 TAX:DEX:BMIalf:TXA:PHA:STAsno
 2300 LDY#255:STYgone:INY:JSRrem
 2310 JMPofl:.alf:RTS:.gb:BRK:BRK
 2320 .wd:OPT FNs(4):.r:OPT FNs(64)
 2330 .sdp:OPT FNs(14):.sh
 2340 OPT FNs(14):.sol:OPT FNs(14)
 2350 .mht:BRK:BRK:.moloc:BRK:BRK
 2360 .mdp:BRK:BRK:]:NEXT
 2370 P%=r:FORT%=0TO31:!P%=&3000+T%*640:
P%=P%+2:NEXT
 2380 A%=0:FORT%=&E00TOwd-1:A%=A%+?T%:NE
XT:PROCstop(&DFB8,1)
 2390 ?q=0:?nm=1:?b=63:?gb=?s2:?s2=&EA:g
b?1=s2?1:s2?1=&EA:!wd=&2010001
 2400 P%=&E00:Z%=FNread(sdp,2,&123D9E14,
2):Z%=FNread(&1101,4,&9CFD030D,3):T%=&16
00:A%=0:REPEAT:READ?T%:A%=A%+?T%:T%=T%+1
:UNTILT%?TRUE=255:PROCstop(&5D3,4)
 2410 ENDPROC
 2420 DEFPROCstop(C%,O%)
 2430 IFC%=A%ENDPROC ELSE:*FX3
 2440 CLS:PRINTTAB(0,10)"THERE IS AN ERR
OR ";:VDU7,7,7
 2450 ONO%GOTO2460,2470,2480,2490,
 2460 PRINT"IN THE ASSEMBLER":END
 2470 PRINT"IN LINE 2820":END
 2480 PRINT"BETWEEN LINES""2830 AND 293
0":END
 2490 PRINT"AFTER LINE 2930":END
 2500 DEFFNs(S%):P%=P%+S%:=T%
 2510 DEFFNread(a%,B%,C%,O%):A%=0:REPEAT
 2520 READA$:!a%=EVAL("&"+A$):A%=A%+!a%:
a%=a%+B%
 2530 UNTILA$="12345678":PROCstop(C%,O%)
:=a%-B%
 2540 DEFPROCshorten:*TAPE
 2550 VDU23,128,223,223;251,251;223,223,
23,129,24,60,60,126,126,126,126,60,23,13
0,255,255,255,255,255,255,255,255,23,131
,153,51,204,102,153,51,204,102,23,132,25
5,129,129,129,255,129,129,129,23,133,255
,255,255,255,255,255,255,255
 2560 ENVELOPE1,4,-1,-1,-1,255,0,2,70,-2
,-2,-2,100,0:ENVELOPE2,1,0,0,0,1,0,0,80,
-80,0,-126,80,0:ENVELOPE3,4,6,-1,-2,10,2
0,20,-1,-1,-1,-5,106,0:ENVELOPE4,1,0,0,0
,1,1,1,80,-1,-1,-1,126,10
 2570 PROChead:PROCbel(200)
 2580 PRINTTAB(14,3)CHR$131"By G.J.Key"
 2590 IFPAGE<>&1900 PROCrelocate
 2600 PRINT'FNlines'TAB(8,7)CHR$134"Use
the following keys,"
 2610 PRINTTAB(12,10)CHR$131"Z........LE
FT"
 2620 PRINTTAB(12,12)CHR$131"X........RI
GHT"
 2630 PRINTTAB(12,14)CHR$131"*........UP
/JUMP"
 2640 PRINTTAB(12,16)CHR$131"?........DO
WN"
 2650 PRINTTAB(12,18)CHR$131"ESCAPE...RE
START"
 2660 PRINT''FNlines;TAB(7,23)CHR$134"PL
EASE WAIT A SHORT WHILE"
 2670 PROCcode:T%=PAGE+1:A$=STRING$(255,
"*"):REPEAT:T%=T%+LENST%+1
 2680 IF?T%=255CLS:PRINTTAB(0,10)"LINE 1
700 IS MISSING OR INCORRECT"CHR$7:END
 2690 A$=$(T%+3):REPEAT:IFLEFT$(A$,1)="
"A$=RIGHT$(A$,LEN(A$)-1)
 2700 UNTILLEFT$(A$,1)<>" "
 2710 UNTILLEFT$(A$,6)="THEEND"
 2720 PROCbel(200):REPEAT
 2730 PRINTTAB(4,23)CHR$(RND(7)+128)"PRE
SS SPACE WHEN YOU ARE READY"
 2740 UNTILINKEY-99:PROCbel(120)
 2750 ?T%=&FF:*FX3,2
 2760 *KEY0OLD|MRUN|M
 2770 *FX138,0,128
 2780 DEFPROCrelocate:*FX138,0,128
 2790 PRINTTAB(0,11)FNlines" PLEASE WAI
T WHILST I RELOCATE TO &1900"FNlines:*F
X3,2
 2800 IFPAGE<&1900:*KEY0FORT%=TOP-PAGE T
O-4STEP-4:T%!&1900=T%!PAGE:N.:PAGE=&1900
|MOLD|MRUN|M
 2810 IFPAGE>&1900:*KEY0FORT%=0TOTOP-PAG
E STEP4:T%!&1900=T%!PAGE:N.|MPAGE=&1900|
MOLD|MRUN|M
 2820 DATA1178,1178,1178,119C,119C,11D8,
1100,240C,240C,240C,3C0C,3C0C,600C,780C,
C000,C000,C000,C000,C000,C000,C000,6018,
C000,1238,1298,12F8,1358,13B8,1418,1478,
14D8,1478,12345678
 2830 DATAA05050,A000FC54,A0,15540000,A8
547E,F000,DA500000,7E88CCCC,A8540050,CFC
F8A00,45EECCCC,5454CF,DBCF4500,8888E6E6,
```

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54DECFCD,E7CF8A00,4444D9D9,A0E5CFCE,CFCF
4500,8ADDCCCC,A0A0CF,EDA80000,B544CCCC,5
0A000A8,2AA00000,50A0B5,FC00,54A8A8,5400
F0A0,54
 2840 DATAAACCCCF8,88,0,CCCCCCF8,CFCC,0,
55CCCCF8,44,0,F3AAFEF0,CCE6,CC4455,F3AAF
AFC,8888F3F3,8A4444,F3000000,CCCC,CFF8CF
00,F355FDF0,4444F3F3,458888,F355F5FC,CCD
9,CC88AA,0,A2F3F3A2,0,A200008A,F3F3F3F3,
A2,F3E745CF,F951F300
 2850 DATA8ACFF3,A251A200,F2A2F3F3,CFE7E
7F3,51A25100,F151F3F3,CFDBDBF3,F3DB8ACF,
F6A2F300,45CFF3,51000045,F3F3F3F3,51,0,5
1F3F351,0
 2860 DATA260C1D2A,22222222,80C0727,808,
F0A000A,2020A05,11110415,33333311,C0C0C0
3,3F0C0C24,270F0A0F,3030727,3322082A,331
12233,18182403,40C0C,3031300,10103,40C2E
15,5000000,4040405,0,0,0
 2870 DATA0,22000000,8080222,808,F0A000A
,2020A05,22260C3F,A1B3322,18181808,3F0C0
C0C,270F0A0F,3030727,11110415,22333311,1
8181802,40C0C,3031300,10103,0,11000000,4
040401,0,0,0
 2880 DATA260C1D2A,22002222,8080D25,0,F0
A000A,2020A05,11110415,33332211,C241803,
3F0C0C0C,270F0A0F,3030727,3322082A,33333
333,180C0C03,4040C,3031300,10103,C2E0415
,5000011,5,0,0,0
 2890 DATA80C1D2A,A000000,808080A,0,0,0,
33110415,33221133,24241803,80C0C,3032300
,20203,2222082A,33333322,C0C0C03,3F0C0C1
8,1B0F050F,3030B1B,190C2E15,11111111,40C
0B1B,404,F050005,101050A
 2900 DATA0,22000000,8080802,0,0,0,22220
82A,11333322,24242401,80C0C,3032300,2020
3,11190C3F,5273311,24242404,3F0C0C0C,1B0
F050F,3030B1B,0,11000000,4040111,404,F05
0005,101050A
 2910 DATAC1D082A,A000022,0A,0,0,0,33110
415,33333333,240C0C03,8080C,3032300,2020
3,2222082A,33331122,C182403,3F0C0C0C,1B0
F050F,3030B1B,190C2E15,11001111,4040E1A,
0,F050005,101050A
 2920 DATA2200082A,22222222,8022222,8080
8,60C0C08,706,11000415,111111,C033333,C0
C0C0C,3030C0C,3030303,3F000000,2233000C,
C033333,C040C0C,3010C0C,1010303,0,0,0,C0
C080A,4,0
 2930 DATA0,0,0,C0C0405,8,0,3F000000,113
3000C,C033333,C080C0C,3020C0C,2020303,22
00082A,222222,C033333,C0C0C0C,3030C0C,30
30303,11000415,11111111,4011111,40404,90
C0C04,B09,12345678
 2940 DATA2,1,3,2,4,2,1,1,2,3,2,4,2,1,2,
2,3,2,1,2,3,2,5,2,3,2,4,2,2,7,2,2,1,3,1,
2,3,2,1,2,4,2,3,1,6,4,2,5,2,4,2,2,4,2,3,
2,4,2,7,2,1,1,2,6,2,3,2,7,2,2,5,2,3,1,6,
1,6,2,4,2,1,3,2,1,2,5,2,4,2,2,2,2,2,2,2,
2,6,2,2,2,2,2,2,2,2,6,2,2
 2950 DATA4,2,1,1,1,1,1,1,3,3,1,1,1,1,1,
1,2,4,7,2,2,2,3,1,1,1,1,1,1,1,1,3,2,2,2,
7,7,2,3,1,3,1,1,1,1,1,1,1,1,3,1,3,2,7,7,
2,3,1,3,1,1,1,1,1,1,1,1,3,1,3,2,7,6,2,2,
2,4,2,4,2,2,2,2,4,2,4,2,2,2,6,2,2,2,2,6,
2,6,2,2,2,2,6,2,6,2,2,2,2
 2960 DATA1,1,4,1,1,4,1,1,1,1,1,1,4,1,1,
4,1,1,2,3,1,3,1,7,1,3,1,1,3,1,7,1,3,1,3,
1,4,1,3,2,3,5,3,1,1,1,1,3,5,3,2,3,1,4,6,
1,1,1,1,1,1,4,1,1,4,1,1,1,1,1,1,6,2,2,2,
2,2,4,2,6,2,2,6,2,4,2,2,2,2,2,2,2,2,2,2,
6,2,2,2,2,2,2,6,2,2,2,2,2
 2970 DATA1,1,1,4,1,1,1,1,1,1,1,1,1,1,4,
1,1,1,4,1,3,5,1,3,4,3,1,1,3,4,3,1,5,3,1,
4,5,1,3,3,1,3,5,4,3,3,4,5,3,1,3,3,1,5,4,
1,3,1,1,1,1,5,3,3,5,1,1,1,1,3,1,4,5,1,1,
1,1,4,1,1,1,1,1,1,1,1,1,1,5,2,2,2,2,2,
6,2,2,2,2,2,2,2,2,2,2,2,2
 2980 DATA1,1,1,1,1,1,1,1,4,1,1,1,1,1,1,
1,1,1,1,4,1,3,1,3,1,3,5,1,3,1,3,1,3,1,4,
1,1,5,1,3,1,4,1,3,1,1,3,1,4,1,3,1,5,1,1,
3,1,3,1,7,1,1,1,4,1,1,7,1,3,1,3,1,1,1,1,
1,1,5,1,1,1,7,1,1,5,1,1,1,1,1,2,2,2,2,2,
2,2,2,2,6,2,2,2,2,2,
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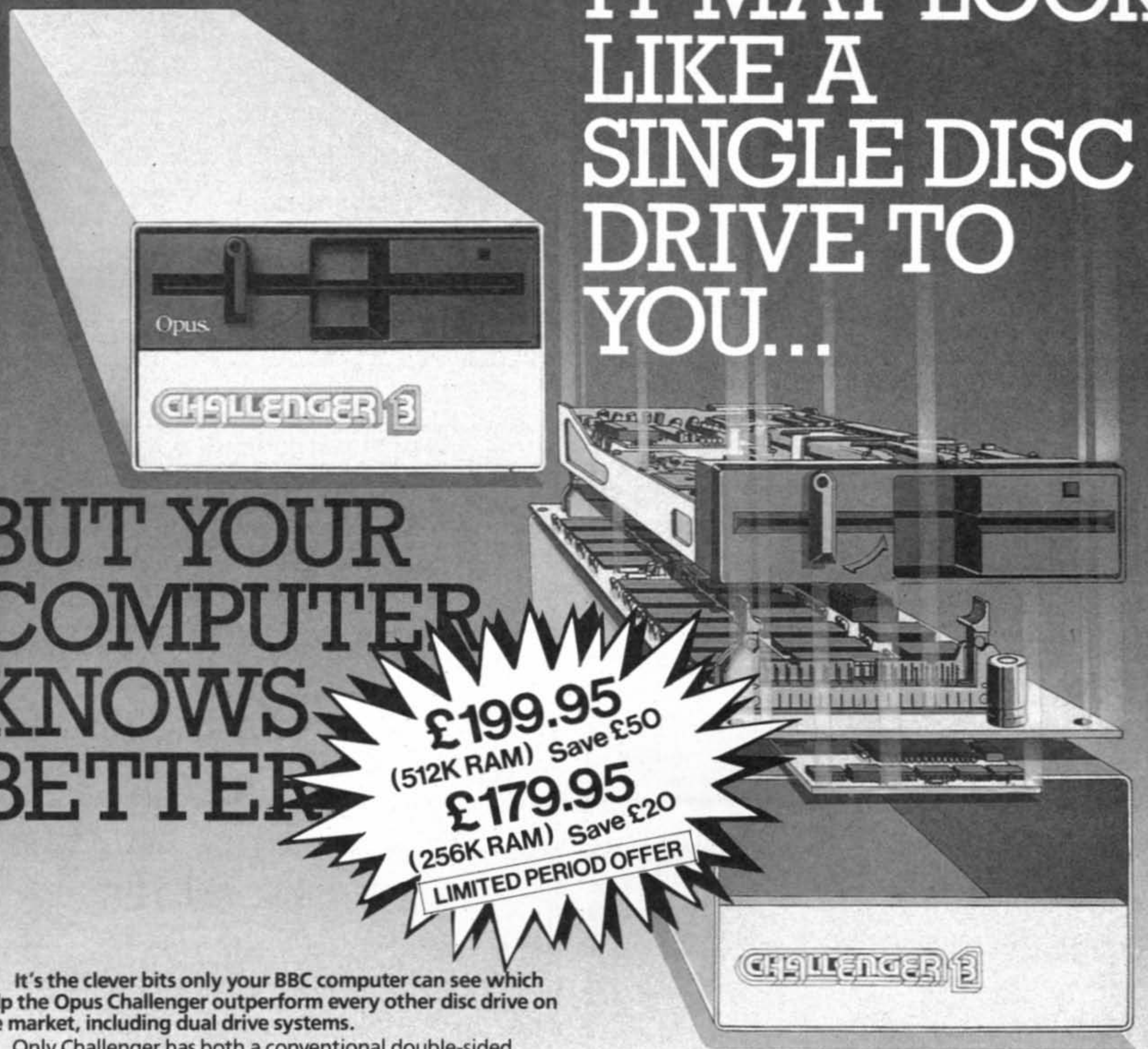

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LETTERS

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Compressing screen dumps to disc

*I THINK that some readers may be interested in a very powerful facility which will (usually) produce compressed screen dumps to disc. This facility is already installed on every BBC Micro, it is the *SPOOL command.*

What is not pointed out in the User Guide is that when a spool file is opened all the bytes that are sent to the VDU drivers are also sent out to the spool file.

This means that VDU instructions (regardless of language in use at the time) can be saved to disc or tape using far less space than would otherwise be the case.

```
   10 *SPOOL LINES
   20 MODE 0
   30 FOR L%=1 to 100
   40 DRAW RND(1300),RND(1 1
00)
   50 NEXT
   60 *SPOOL
```

*When you run this program a file called LINES is created and if you type in the command *EXEC LINES, the screen display produced by running the last program will be replayed to the screen.*

Line 60 is needed to close the file before the Basic prompt > is printed, or that will be sent to the file as well. This simple method works for all the PRINT, PLOT, MOVE, DRAW, VDU commands and so on.

*There are several advantages using this technique. It saves valuable programming space and there will be a reduction of disc space needed to save the screen in comparison to using the *SAVE command.*

Machine code programmers can use this method to compile a list of the raw VDU codes to be sent to oswrch. All the necessary padding zeros are there – let the computer do the work for you. – **Jim Sharp, Featherstone, West Yorks.**

Teletext alternatives

I NOTICE in February's issue of The Micro User *that you have once again put on offer the BBC Micro Teletext System and since this is similar to that of last year I cannot praise the value of the offer enough.*

I have no experience of the alternatives on the market but can honestly say that this has been the most useful and entertaining add-on purchased for my micro.

The range of information and software available and the ease of downloading is enough to occupy anyone for hours every day.

The fact that many of the programs are reproduced from past issues of The Micro User *is an added bonus.* – **Tony Lawrence, Wigston, Leics.**

Back to basics

THANKS for going back to basics in computer logic, I found your article on Karnaugh mapping in the September 1986 issue of The Micro User *mentally stimulating as well as very interesting.*

Suddenly my children's algebra of sets, which I'd regarded as a pretty pointless exercise in the obvious, takes on meaning.

However, you did make a couple of quantum leaps which left me questioning your reasoning.

By choosing a non-sequential order for the ABCD values your map is rather random. If I use the logical order $\bar{B}\bar{A}$ $\bar{B}A$ $B\bar{A}$ BA across the top and $\bar{D}\bar{C}$ $\bar{D}C$ $D\bar{C}$ DC down the side then the cell values ready sequentially from 0 to F.

Is there any reason why this should not be done and if not why you chose your order?

The resultant cell groupings using such varying networks also differ leading to different Boolean expressions. Are they all valid?

The second leap of imagination was that after you explained the structure of the various gates (all having two inputs except the inverter with just one), you then showed NAND gates with 3 and 5 inputs. Surely this isn't possible?

A minor point also on NAND gates on a matter of economy. Why add a second inverter to AND to make NAND when one could just make a NAND gate? – **Peter Noble, Old Glossop, Derbyshire.**

- *Mike Cook replies:*

Thanks for the encouragement.

First let me take you to task: The definition of "quantum leap" is: "the smallest quantity ... a system can possess". I wish people would stop misusing the word.

Secondly the reason for the

Turn to Page 146 ▶

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- **Want to write to Micromail? The address is: Letters The Micro User, Europa House, 68 Chester Road, Hazel Grove, Stockport SK7 5NY.**

Writers of the most interesting letters receive a £10 prize.

Not word-perfect

I WAS very interested to read Jim Notman's review of Inter-Word in January's edition of The Micro User.

As he rightly pointed out it does "stand head and shoulders" above anything else currently available for the BBC Micro.

However, I was surprised that he was unable to find any fault with the program. In my three months with Inter-Word I have encountered a problem which renders the program almost unusable in some circumstances.

I refer of course to its inability to include both double and single spaced type in the same document.

In many situations this will not be considered important, but in the production of scholarly papers (such as projects and reports for colleges and universities, as well as some journals) it is absolutely vital.

Generally you are required to submit documents in double-spaced format, with single-spaced block quotations and footnotes.

Although the desired effect can be obtained by inserting printer codes at the appropriate points within the document, this is not visible on the screen and cannot be used in paged mode without affecting the page length.

I would be grateful if any readers could suggest a way round this problem as I would be sorry to part with such an otherwise outstanding program. – **John C. Surridge, Bracknell, Berks.**

LETTERS

◀ *From Page 145*

ordering was explained in the article. It was so that adjacent squares changed by only one variable.

With your method two variables change when going from the second to third column. If you do this, grouping will not work and the results are meaningless. In fact you should not be able to make any groups at all.

It is possible to have any gate with any number of inputs. For example on a three input NAND gate there will only be a logic one output when all three inputs are zero or for a three input AND gate the output is true when A AND B AND C are true.

Finally I am not sure that I follow what you are saying. In a NAND gate the concept is of an AND gate followed by a NOT gate.

When this is implemented on to silicon it can usually be achieved with a single transistor. The economy comes from having a flexible gate – the NAND gate – with which you can make all the functions NOR, OR, AND, NOT and EXCLUSIVE OR so you do not need to have lots of different types of gate.

File transfer

IN my 80 to 40 file transfer program published in the March issue of The Micro User, *the program has to be saved as 8040, otherwise line 130 won't work.*
– **Dr.Goatly, Wimbledon.**

After-sales service

I AM writing to you about after-sales service. If people are expected to pay £400+ for a micro they are entitled to a competent network of repair facilities and user support.

A year ago my micro developed a DFS fault and refused to access the disc so I took it to a recommended repairer.

After spending over £60 the problem was not solved. Frustrated, I wrote to Acorn. They told me not to worry and gave me another address of a "recommended repairer". I sent my micro.

Months passed by, I rang the company and my computer was returned many weeks later. A rom was not returned with it and it was weeks before it came back. The rom board was disconnected so that it would not be damaged in transit. When I reconnected it, it wouldn't work. I sent it back two further times and after each return it failed to work.

In desperation I sent it to Acorn – and it never arrived.

I do not blame Acorn for the faulty repairs directly. But Acorn ought to provide the essential "return to manufacturer" repair facility.

Just look at Acorn's alternative. It was their choice for implementing this policy. The general attitude of Acorn has not been satisfactory. – **I.S. Gibson, Maidstone, Kent.**

● The rules for dealing with companies of any sort are these: Always keep copies of letters you send, and never throw away letters sent to you.

Always keep telephone notes, but never use a tape recorder unless you tell the person you are recording and they agree to it.

If you send any piece of hardware, send it either by registered mail, Datapost or use the new Post Office Trakback service.

Printing listings

APART from the fact that I am 65 years of age and find the printing rather small, I am well disposed towards the new style of printing programs in the March Issue of The Micro User.

The 40 line layout is very helpful, but just one point: It is not very easy to recognise a quotation mark mixed along with any apostrophe markings.

Another valuable point is the ability to distinguish between I and 1 infinitely more easily. If a ban could be placed on the use of I there would be much hope for copy typists.

There is, however, a printing error contained in the latter part of Line 2890 on Page 148 where a number 1 has not been properly indicated.

Also, in connection with the game Dino, I have not had the slightest success in being able to make the program work.

As an avid copier of so many games in your publication, I have a large stock of successfully listed items and I have learnt how fallible the typist can be in missing sight of the obvious error.

Having due regard to all that, I cannot get beyond a warning (after the initial screen) "Bad Hex at 2590". No way can I discover the error if it is on my part.

Perhaps you would be good enough to process the enclosed order for the disc containing this game – I want to try and find out if I have made an error or if there are some errors in the listing. – **S. Morcroft, Dunkinfield, Cheshire.**

● Thank you for your comments about the new style of listings.

After much experiment we

£10 Prize letter

Enhancing ADFS menus

I FOUND the ADFS Menu by John McCrae in the January issue of The Micro User *particularly useful as I have recently upgraded to 1770 FDC and ADFS.*

However, because PAGE now defaults to &1F00 there is insufficient memory to run the program in MODE 1.

Deleting all the REM statements helps, but I felt that as the program could be enhanced by adding the facility of going back up a level (that is, up the directory tree), a less greedy mode was needed.

I chose the 2-colour Mode 4 and modified the program so that instead of using a different colour to indicate a directory, the letter D is used to prefix the directory name.

Change the program as follows: Delete all REM statements and lines 590, 1330, 1350, 1360, 1410, 1420, 1500 and 1590. Modify:

```
   60 IF FNos<2 MODE4 ELSE
MODE129
  610 IF ?(point%+3)>128 PR
INT" D"SPC1$name%:GOTO630
  620 PRINTSPC3$name%
 1320 VDU19,0,4;0;:REM Blue
 background
 1340 VDU19,1,7;0;:REM Whit
e text
 1380 PRINTTAB(5,9)"A to Z
to select Prog/Path."
 1390 PRINTTAB(5,11)"TAB fo
r next directory"SPC3
 1400 PRINTTAB(5,12)"* to e
xit"SPC5"0/1 to Mount."
  682 IF D%<>13 THEN 700
```

Add new lines for the "go up a level" facility:

```
  685 pl%=LENpath$:count%=0
  686 REPEAT
  687 ch$=MID$(path$,pl%-co
unt%,1)
  688 count%=count%+1
  689 UNTIL ch$="." OR coun
t%=pl%+1
  690 dir$=RIGHT$(path$,cou
nt%-1)
  691 path$=LEFT$(path$,pl%
-count%)
  692 IF pl%=1 path$=""
  693 IF pl%=0 path$="":dir
$="$":PRINT''SPC5"Already i
n root directory":FORQ=1TO3
000:NEXT
  694 GOTO280
 1375 PRINTTAB(5,8)"Press a
 key:"
 1385 PRINTTAB(5,10)"RETURN
 to go up a level."SPC3
```

– **H.L. Smith, Little Bealings, Woodbridge.**

LETTERS

ALL programs printed in this magazine are exact reproduction of listings taken from running programs which have been thoroughly tested.

However, on the rare occasions when mistakes occur corrections are published as a matter of urgency. Should you encounter error messages when you type in a program, they will almost certainly be the result of your own typing mistakes.

Unfortunately we can no longer answer personal programming queries concerning these mistakes. Of course letters about suggested errors will be investigated without delay, but any replies found necessary will only appear in the mail pages.

finally decided that 40 column lines were essential and reached the compromise that the typeface had to be slightly smaller but even so we find the new style much clearer.

The problem with quotation marks and apostrophes will soon also be cured.

Although the listings are now printed using a professional laser typesetter, they came directly from a BBC Micro and, as with all our programs, Dino has been thoroughly tested.

The printing fault you mention was caused by dirt getting on to the negative at the printers, but you were correct assuming a 1 had been deformed.

Your Bad Hex at 2590 is probably caused by a typing error causing A$ to be set up wrong somewhere else in the program, but we've passed your order to the appropriate department and when the disc arrives I'm sure you won't be disappointed with Dino.

Date stamp correction

FOUR months ago I purchased a BBC Master and have successfully typed in numerous programs from The Micro User. *However I am having trouble with two in the February issue, Rhondo and Date Stamp. In Rhondo I get "No room at L.2400", and in the Date Stamp program I keep getting the "Bad Checksum" message. Could you please advise me.* – **A.M. Harris, Whetstone, London.**

● In regard to Rhondo the listing is definitely correct, but we are sorry to say that line 580 in the Date Stamp should read:

```
580 IF sum%<>&40A2 PRINT"
Bad Checksum - it should be
&40A2":END
```

We apologise to any readers frustrated by this error.

Previewing files

£10 Prize letter

FURTHER to your reply to R. Chadwick about previewing long files in Wordwise in the February issue of The Micro User, *there is a simple but fiddly trick which allows disc-based Wordwise Plus users to preview files of any length in 80 column format, even with minimum memory.*

The secret is to make a little file containing nothing but an embedded command to print the long file, then load and preview the little one.

Since the file actually being previewed is very short, preview takes place in 80 columns, however long the big file.

Admittedly disc accesses do slow down the preview, but the text still scrolls up too fast for comfortable reading.

As usual in Wordwise, scrolling can be stopped and restarted by pressing the spacebar.

For example, if the file BOOK is too long to preview in 80 columns, make a file called (say) PV (for preview) which contains only:

f1 PF "file" *f2*

and load and preview PV.

This works only with the PF embedded command in Wordwise Plus – it does not work with the GF command in ordinary Wordwise. – **Brian L. Kershaw, King's Heath, Birmingham.**

Body building

WITH regard to Mike Cook's article on using conducting foam, fairly good contacts can be made to this material using a standard office

Turn to Page 148 ▶

More tricks for the 6845

I READ Paul Carpenter's letter on hardware scrolling in the February issue of The Micro User, *and I thought you'd be interested in a few more tricks the 6845 CRTC can do.*

If you've ever used VDU24 or VDU28 to define the area of screen you may not know you can use the spare graphics memory as program space.

The registers you need to know are:

```
R2 (=98) : left border (in bytes)
R1 (=80) : bytes per line
In MODE 0, 1 character = 1 column of 8 bytes
In MODE 1, 1 character = 2 columns of 8 bytes
In MODE 2, 1 character = 4 columns of 8 bytes
R7 (=34) : top border (in characters)
```

The numbers refer to MODE 0, 1 and 2 values. The area of screen switched off is black and the spare memory is between the screen memory and rom memory.

*To switch the screen memory next to the rom, so the program area is all together, you alter R12 and R13 so that if "A" is start of screen memory DIV 8 (=&1000-R1*R6), then R12 = A DIV256, and R13 = AMOD256. HIMEM = A*8, but as the rom operates as if nothing has happened, a Basic program is virtually impossible.*

CLS and CLG will clear the spare memory (unless they can be adjusted using VDU24 and VDU28), hardware scrolling (done automatically by the operating system) is to be avoided, and if R1 is altered a lot of graphic functions are confused.

If you've ever wondered how some programs, like Citadel, seem too long for their graphics mode, they most probably use this.

The following program produces a small MODE 2 screen, but the program area extends to the MODE 4 and 5 HIMEM value (&5800).

```
100 DIM code 99
110 FOR L%=0 TO 2 STEP 2
120 P%=code:[OPT L%
130  LDY #11
140 .loop LDA ary,Y
150  STA &FE00:DEY
160  LDA ary,Y:STA &FE01
170  DEY:BPL loop:RTS
180 ]:ary=P%:NEXT
190 FOR P%=ary TO ary+11
200 READ ?P%:NEXT
210 DATA 0,13,11,12,20,6
220 DATA 28,7,64,1,90,2
230 MODE 2:CALL code
```

– **Robert Chambers, Bury, Huntingdon, Cambs.**

◀ **From Page 147**

stapler. The staples should be cleaned with Acetone before use and can have wires soldered directly to them.

The foam can also be attached to a card or similar material with staples. An alternative is to simply sew the foam with fine constantan wire.

Conducting paints based on copper, silver and graphite are available. Silver based epoxy resins are available, but are rather expensive.

A fairly flexible and perfectly serviceable conducting adhesive can be made up using very dilute cellulose acetate, for example Durofix+ amyl acetate and graphite powder.

You need very little solution for quite a lot of graphite. Adding too much acetate will make the cement non-conducting.

A very permanent coating can be made by adding a drop of dilute waterglass to graphite powder. The coating may be baked on after it has dried. It also sticks to glass and ceramics very well.

I hope that this information may be of interest to you for simple experimental projects. – **C.J.Chapman, Nuneaton, Warwicks.**

Disc utilities

I AM trying to write a disc utility program which uses the DFS star commands, but I don't know how to use them from Basic. Can you help? – **Brychan W., LLanfilo, Brecon.**

● Because other roms cannot recognise Basic variables, such as file names in string variables, you need a way of transferring the contents of the string to the rom.

Here's a simple procedure you can include in your programs and an example of how to use it.

```
100 REPEAT
110 INPUT"File name",f$
120 PROCcli("INFO "+f$)
130 UNTIL FALSE
140 DEF PROCcli($&700)
150 LOCAL X%,Y%:Y%=7
160 CALL &FFF7:ENDPROC
```

Confessions of a faint-hearted Micro User

Trouble with Boolean bugs

Dear Trev,

Why do things keep getting worse? Why does life pick on me?

All right, I admit that I'm used to being a walking disaster area. For me ring-pull cans don't and the toast always lands butterside-down. Banana skins lie in wait.

I accept this. After a lifetime of wet drip-dry shirts and stuck-up non-stick pans I'd die of shock if I opened a tin of ointment that didn't have a fly in it.

But it's a bit much when The Micro User *puts the knife in as well.*

It all started when I decided that I was going to write a proper program, one that worked. And to impress Doreen I planned to write something that would be useful for her teaching – despite her repeated claims that "I don't teach, I survive".

She said that the most useful thing I could do was to write a program that calculated the number of days left until the school holidays.

It would also be nice if it could come up with a selection of original excuses for taking days off, with a facility to prevent duplication. (She's buried five grandmothers already.)

I wanted something more educational and one of Ludwig's lectures had given me an idea. The subject was Boolean Algebra which, despite Clive's assurances to the contrary, is not about French balls.

It was the ideal subject! I'd write a program to take one of those horrible complicated AND, NOT and OR conditions and produce in its place a nice, simple condition.

The Beeb is full of logical operators so I thought I wouldn't have many problems. Why do I bother thinking?

After several nights nail biting, swearing and drinking black coffee my masterpiece was ready.

Only it wasn't. It had a bug in it and I couldn't find where. Bored and angry I went downstairs to watch Micro Dead in an effort to prove to myself that some people know even less about micros than I do.

"What's the matter with you?" asked Andrea, busy knitting a clapper cosy to keep the bells warm.

"I've got a bug", I muttered.

"Well take a aspirin", came the reply.

"Not me, my program."

"Well don't take it out on me. I thought with all the time you spend at night-school and doing your homework with that Doreen you'd be able to get a program working."

"It does work, only sometimes it doesn't", I whined.

"Well cut out the bits that don't work and use the rest."

I was tempted to do the same with Andrea but instead stormed out of the house yelling "I'm off to Doreen's for a bit".

Doreen's house was surprisingly peaceful – apparently the kids have got themselves a part-time job at a car-wrecker's yard.

"They're better than all the machinery", enthused Doreen as she lead me upstairs to her study.

"Right, let's see what you've got", she ordered, reaching out and grabbing my masterpiece.

"I'm afraid it doesn't work all the time," I murmured.

"So what's new?" was the answer.

"No", I persevered, "It's got an intermittent bug in it."

"Oh that should be no problem, show us your Pseudocode and we'll soon sort it out."

And that was how The Micro User *nobbled me. Apparently some fool has been mouthing on about Pseudocode and structure and Doreen has taken it to heart.*

Of course I hadn't bothered to write any and I told her so. In fact we had words about it. Gone are my days of unconditional jumps.

Now I'm stuck with iteration and functional decomposition which sound more like the results of a bug than a way of avoiding them.

From the way Doreen went on you would have thought my programs needed vaccinating.

The last straw came when she put my code through the Debugger, an error-finding program written by a Dutchman.

It didn't tell me what my mistakes were but flashed up a very nice animated scoreboard that read "Structure 0, Bugs 5" accompanied by the Match of the Day theme.

With that I took myself off to the Ram and Buffer where I told Clive I was never writing a program again. He said he wasn't aware that I ever had done.

Why do I bother? Yours,

Bob

PS: Ludwig has debugged my program. He says that what Doreen said about either my ANDs and ORs or my XORs and NOTs was not true though my NOT TRUEs were FALSE and that was why my ANDs and ORs were not always working. Logical really. ■

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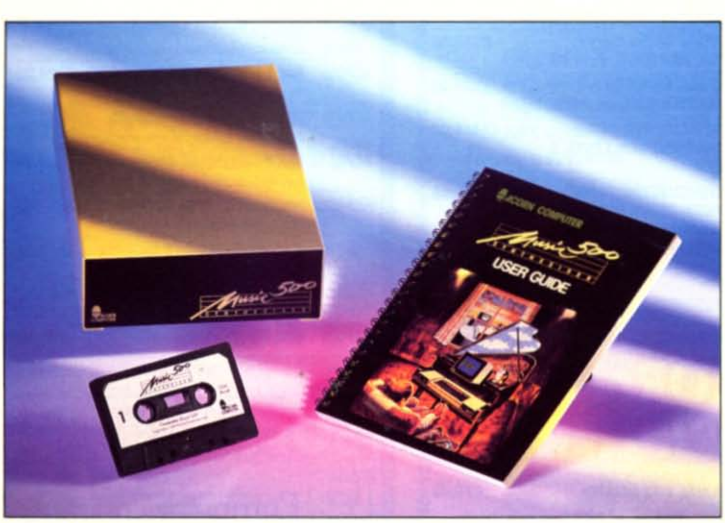

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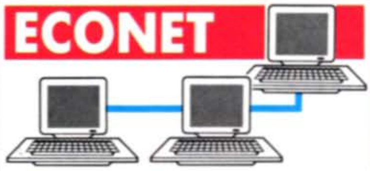

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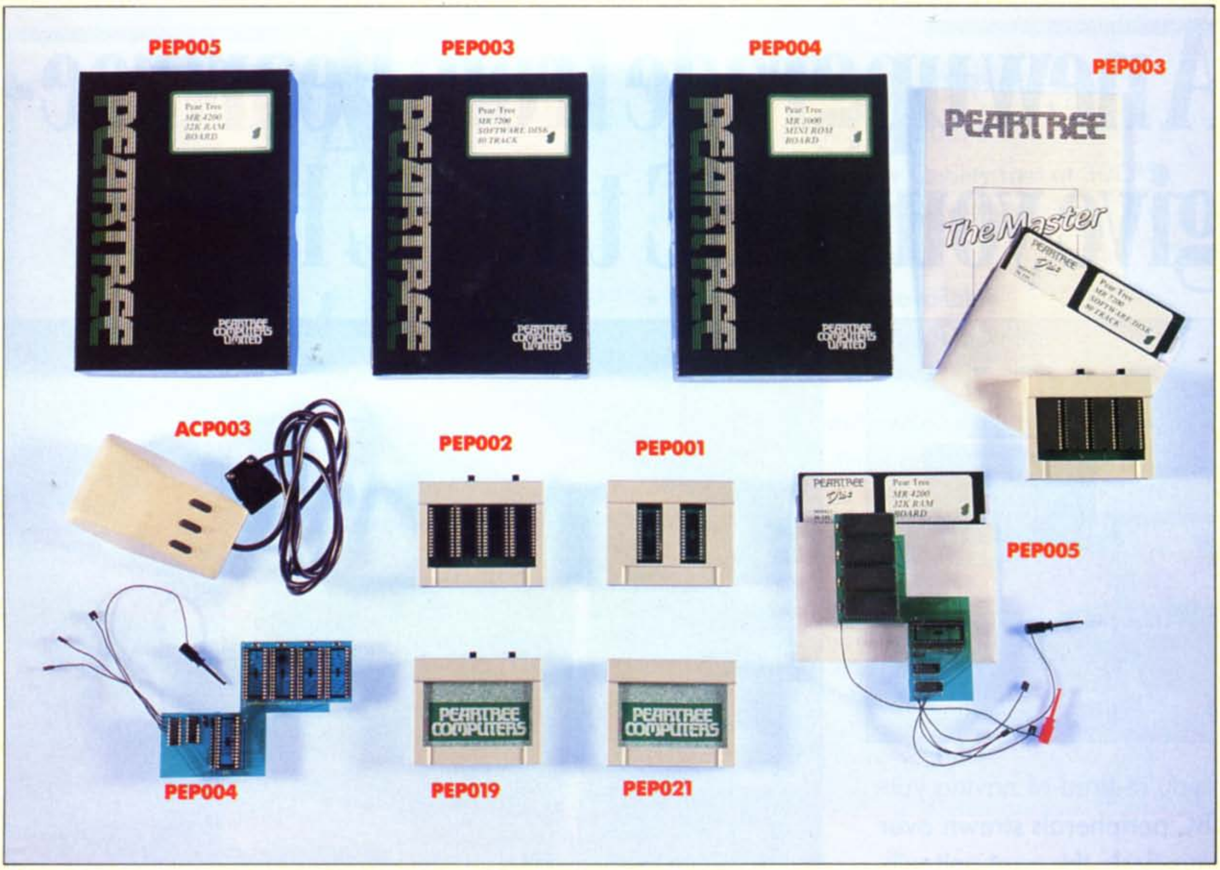

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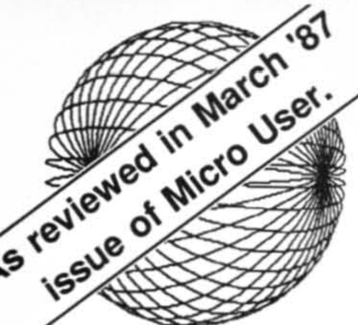
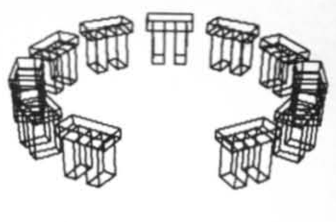


```
((  \ draw a ball using circles
DO
    FROM  5   BY  10   TO  175
LOOP
    \ pitch back by loop index
    \  and apply 40 degree yaw
    ROTN 0,#X,40
    \ then draw a full circle
    ARC 360,400
END_DO
))
```

```
( shown above and opposite  are
  examples of 3D GRAPHICS using
  built-in  HALCIEN  keywords )
```

HALCIEN



```
PROC 'PI_BOXES' \ 3 boxes set
ICON 3D \ up as a 'PI' symbol
POSN  -75,0,50 BOX 50,100,200
POSN   25,0,50 BOX 50,100,200
POSN -100,0, 0 BOX 200,100,50
END_IC
END_P

((  \ draw a ring of PI_BOXES
DO
    FROM 30  BY 30  TO 330
LOOP
    3D POSN 0,0,1500
    \ roll by loop index &
    \  pitch by 60 degrees
    ROTN #X,60
    2D GAP 0,-600
    PI_BOXES
END_DO
))
```

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HALCIEN has a complete range of general-purpose programming language features (see opposite) plus a powerful suite of built-in keywords that support AUTOMATED TEXT FILE EDITING along with both TWO and THREE DIMENSIONAL GRAPHICS PROCESSING.

Amazingly, HALCIEN resides within a single, easily installed 16K ROM — available NOW for the BBC B, B+ and Master series. The HALCIEN package includes a comprehensive User Guide and disc of easily customised utility and demonstration programs.

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- A high degree of 'orthogonality'— parametric values can be presented as literals, variables, procedures or expressions.
- A powerful set of tools for processing a RAM text file both manually (via a screen editing mode) and automatically (using a comprehensive suite of language keywords that can be used within HALCIEN programs of any complexity). These include flexible, bidirectional text cursor movement; string searching; text string insertion, overwrite, exchange or deletion; text block processing; efficient program access to both string AND numeric data values held in textual form.
- A graphics keyword set that allows complex image components ('icons') to be defined with ease, positioned, scaled and rotated through any angle (not just 90 degree steps) — all performed rapidly under full program control. Icon position, size and rotation values can be nested for fully 'structured' image generation. HALCIEN supports both TWO and THREE dimensional wire-frame drawing within a graphics space of 64K units cubed (where the screen is 1K units high). The Earth image above is just one view of an 850+ point 3D icon of the entire planet — supplied on the utility disc as an animated demonstration (in full colour on the Master). HALCIEN is truly a language with GLOBAL application!

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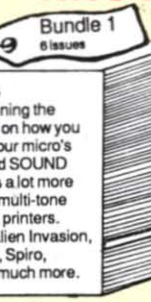

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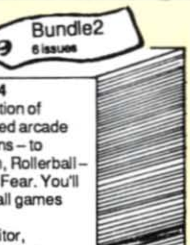

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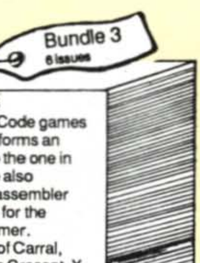

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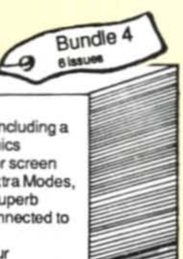
Learn to write Machine Code games with a super series that forms an essintial complement to the one in this issue. The package also includes a powerful disassembler and plenty of useful tips for the machine code programmer.
ALSO – Rover, Palace of Carral, Astromines, Mornington Cresent, X-15, Steller Rescue, Othello and much much more.



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Lot's of fun with graphics including a review of the Acorn Graphics Extension Rom, utilities for screen scrolling and three new extra Modes, And how you can obtain superb effects with your micro connected to a video.
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FEBRUARY 1987: Rhondo, all the fun at the fair in this fast-action shooting gallery spectacular. 6502 Games, a demonstration of collision detection routines for machine code game programmers. Choice, develop your childs decision making skills. Map test, grid reference game Date Stamp, save time when filing. List Hold, stop that scrolling screen. Wordwise Plus Index, indexing plus file description. Compressor, variable name compactor. Body Building, super fast A to D converter and multi channel oscilloscope. *Plus Save a life, the life-saving tutorial.*

MARCH 1987: Dino, ride the gobblosaurus in this entertaining prehistoric rom. Birthday Mystery, use logic and elimination to discover the implement of a serious crime. Half-Life, a radio-active random decay simulation. Compressor II,save memory by creating multi-statement lines. Teletext Carousel, a utility for the Morley Teletext Adapter. Hac Man, the Jet Set Willy II Upgrade. Command Clashes, rom problem solved. Body Building, software for temperature measurement. 6502 Games, collision detection demonstration. Library, three useful routines.

APRIL 1987: Hunkie Egg, collect the eggs in our fast action Easter game. Biomorphs, create creatures with this fascinating simulation. Disc Protection, a utility to stop your discs being pirated. Counting, the program for the DIY keyboard. 6502 Games, how to make your sprites follow the leader. *Plus four more routines from the Library.*

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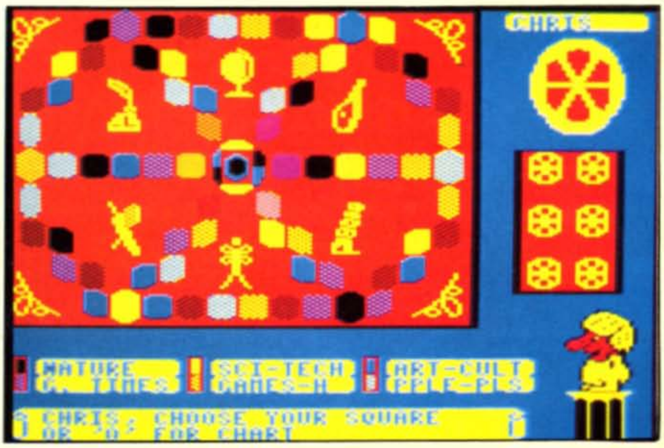

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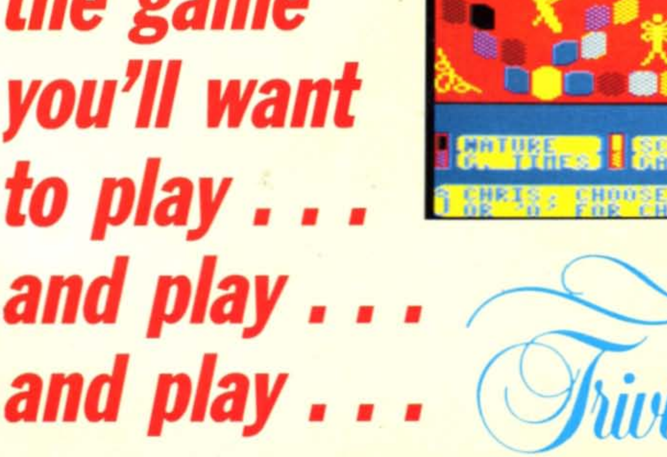

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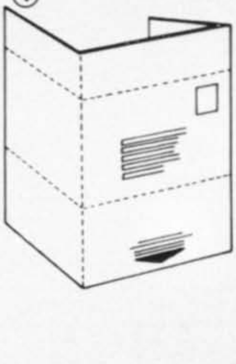

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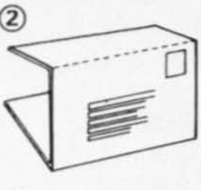

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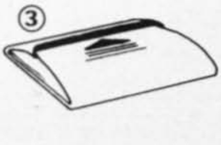

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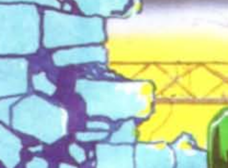
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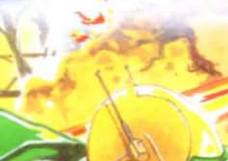
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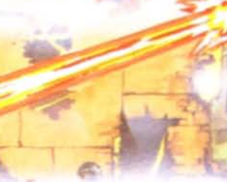
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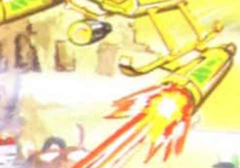
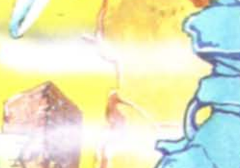

Enemy equipment (Enhanced BBC Master version)


A camouflaged Battle fortress (Enhanced BBC Master version)

STRYKER'S RUN for the BBC Micro B, B+, Master and Master Compact.

Compatible with the BBC B, B+, Master and Master Compact computers.

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For many years, a war has ensued between the Allied Nations and the Volgans. The battle was reaching a stalemate position, but recently the Allies through good intelligence work and some luck have managed to obtain the plans of the Volgan's next offensive. If the Allied Forces can capitalise on these plans they can end the impasse and the war. You play the role of Commander John Stryker commissioned to take this top-secret information to the Allies' HQ.

Your character in the game can jump, run, duck, fire his laser pistol and throw grenades. He can also board aircraft and fly them, making use of their more powerful weaponry.

Your opponents, the Volgans, have a variety of weapons at their disposal comprising rifles, pistols, grenades, machine-guns, mortars, mines, helicopter gunships, rocket launchers and SAM missiles.

Game Author: Chris Roberts.

PRICE: £9.95 (cassette), £11.95 (BBC Micro 5¼" disc), £14.95 (Master Compact 3½" disc).

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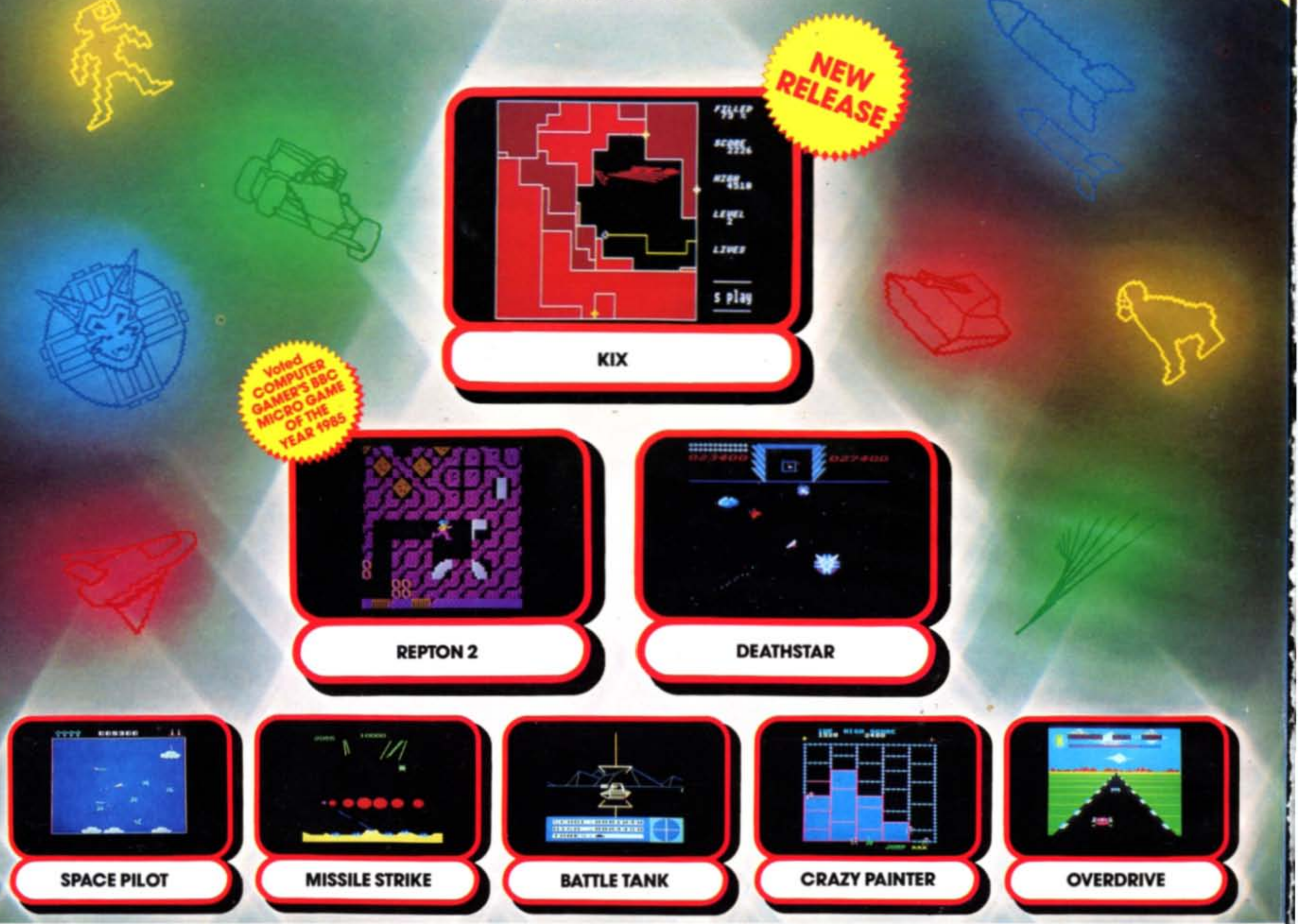

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Instructions	70%	
Playability	100%	Awarded
Graphics	100%	★★★★★
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